THE CITY OF SAN DIEGO

Annual Receiving Waters Monitoring Report for the Point Loma Ocean Outfall 2003

Ocean Monitoring Program

Metropolitan Wastewater Department

Environmental Monitoring and Technical Services Division

THE CITY OF SAN DIEGO

July 1, 2004

Mr. John Robertus
Executive Officer
Regional Water Quality Control Board
San Diego Region
9771 Clairemont Mesa Blvd. Suite B
San Diego, CA 92124

Attention: POTW Compliance Unit

Dear Sir:

Enclosed is the 2003 Annual Receiving Waters Monitoring Report for NPDES Permit No. CA0107409, Order No. R9-2002-0025 for the City of San Diego Point Loma Wastewater Treatment Plant, Point Loma Ocean Outfall. This report contains data summaries and statistical analyses for the various portions of the ocean monitoring program, including oceanographic conditions, microbiology, sediment characteristics, benthic infauna, demersal fishes and megabenthic invertebrates, and bioaccumulation of contaminants in fish tissues.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

ALAN C. LANGWORTHY
Deputy Metropolitan Wastewater Director

dp
Enclosure

cc Department of Environmental Health, County of San Diego
U.S. Environmental Protection Agency, Region 9
Metropolitan Wastewater Department Library, City of San Diego

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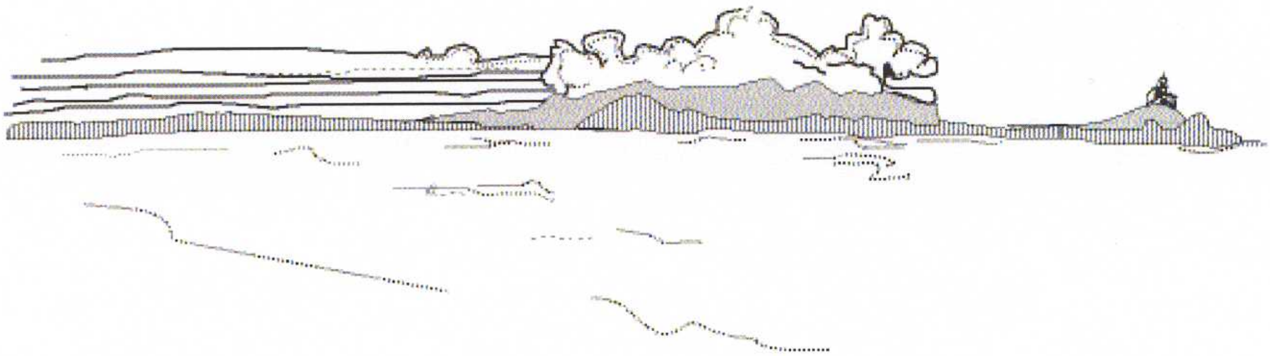
2003



Prepared by:

City of San Diego

Ocean Monitoring Program

Metropolitan Wastewater Department

Environmental Monitoring and Technical Services Division

July 2004

Table of Contents

Table of Contents continued

APPENDICES

Credits and Acknowledgments

Annual Receiving Waters Monitoring Report
for the Point Loma Ocean Outfall
2003

Technical Editors
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Executive Summary
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Chapter 1. General Introduction
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Chapter 2. Oceanographic Conditions
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Chapter 3. Microbiology
Dean Pasko   Diane O'Donohue

Chapter 4. Sediment Characteristics
Daniel Ituarte

Chapter 5. Macrobenthic Communities
Nick Haring   Eric Nestler

Chapter 6. Demersal Fishes & Megabenthic Invertebrates
Ami Groce   Robin Gartman

Chapter 7. Bioaccumulation of Contaminants in Fish Tissues
Ami Groce

Glossary
Nick Haring

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Executive Summary

Environmental Monitoring and Technical Services Laboratory
2392 Kincaid Road, San Diego, California

Executive Summary

The City of San Diego's ocean monitoring program for the Point Loma Wastewater Treatment Plant (PLWTP) is mandated by Order No. R9-2002-0025, National Pollutant Discharge Elimination System (NPDES) Permit No. CA0107409 issued by the San Diego Regional Water Quality Control Board (RWQCB) and the United States Environmental Protection Agency (USEPA). The above Order and associated Monitoring and Reporting Program (MRP No. R9-2002-0025) were modified with the adoption of Addendum No. 1, which became effective on August 1, 2003 (see Chapter 1). These documents specify the terms and conditions that allow treated effluent to be discharged into the Pacific Ocean via the Point Loma Ocean Outfall (PLOO) and define the requirements for monitoring the receiving waters surrounding the PLOO, including the sampling plan, compliance criteria, laboratory analyses, statistical analyses, and reporting guidelines.

The City's ocean monitoring program for the PLWTP is designed to assess the impact of wastewater discharged through the PLOO on the marine environment off San Diego. The main objectives of the program are to provide data that satisfy the requirements of the NPDES permit, demonstrate compliance with the 2001 California Ocean Plan, track movement and dispersion of the wastewater field, and identify any biological or chemical changes that may be associated with the discharge of wastewater. These data are used to document the effects of the discharge on water quality, sediments, and the marine biota.

The study area off Point Loma is centered around the discharge site, which is located approximately 7.2 km offshore of the treatment plant at depths of around 94–98 m. The receiving waters monitoring program encompasses an area from La Jolla to Imperial Beach, and extends from the shoreline to the outer coastal shelf at depths up to about 116 m. The progam may be divided into several major components, which comprise separate chapters in this report. These include analyses of oceanographic conditions, microbiology, sediment characteristics, benthic macrofauna, demersal fish and invertebrate communities, and the concentrations of contaminants in fish tissues. Data regarding various physical and chemical oceanographic parameters are evaluated to characterize water mass transport potential in the region. Water quality monitoring along the shoreline and in offshore waters includes the measurement of bacteriological indicators to assess natural (e.g., river and streams) and anthropogenic (e.g., stormwater and wastewater) impacts on recreational waters. Benthic monitoring includes sampling and analyses of soft-bottom macrofuanal communities and their associated sediments, while demersal fish and megabenthic invertebrate communities are the focus of trawling activities. The monitoring of fish populations is supplemented by analyses the accumulation of contaminants in fish tissues to determine whether or not contaminants are present in the tissues of "local" fish species. In addition to the above activities, the City also supports other projects that are relevant to assessing ocean quality in the region. Results from the coastal remote sensing study of the San Diego/Tijuana region that is jointly funded by the City, the RWQCB, and the International Boundary and Water Commission have been incorporated into the interpretations of data from the oceanographic and microbiological surveys (Chapters 2 and 3). In addition, the City funds a long-term and ongoing study of the Point Loma kelp forest that is being conducted by scientists at the Scripps Institution of Oceanography. Data from this study were summarized in 2002 (see City of San Diego 2003). A general overview and a brief summary for each of the receiving waters monitoring components are included below.

After 10 years of wastewater discharge, the data indicate that the PLOO has had only a limited effect on the local marine environment off San Diego. For example, water samples collected in the Point Loma kelp bed in 2003 were 100% compliant with California Ocean Plan bacterial water-contact standards, as they have been ever since the outfall was extended in 1993. In addition, there has been no evidence that the waste field from the outfall has affected any of the shoreline areas over the same period. Instead, the few incidences of high bacterial counts that exceeded compliance standards at the shoreline stations in 2003 were typically associated with increased rainfall. In contrast, elevated bacterial concentrations that may be attributable to wastewater discharge in 2003 were generally restricted to sites adjacent to the outfall and at subsurface depths of 60 m or below. Furthermore, there has been no evidence of change in any of the physical or chemical water quality parameters (e.g., dissolved oxygen, pH) that can be attributed to wastewater discharge via the PLOO.

Analyses of benthic conditions off Point Loma in 2003 and previous years indicate that some types of changes that may be expected near a large ocean outfall have occurred, although these have been restricted to a relatively small, localized region near the discharge site. For example, analysis of sediment quality data continue to show slight increases over time in sediment concentrations of sulfides and BOD, and the accumulation of coarse sediment particles in the vicinity of the outfall pipe. However, other potential indicators of impact such as concentrations of various sediment contaminants (e.g., trace metals and pesticides) showed no patterns that may be related to the discharge of wastewater. Values for descriptors of benthic community structure (i.e., species diversity, infaunal abundance, populations of the brittle star *Amphiodia urtica*, ITI and BRI values) have shown some differences between near-ZID and reference stations overtime, but remain characteristic of natural environmental conditions. Furthermore, analyses of demersal fish and invertebrate communities also reveal no spatial or temporal patterns that can be attributed to the PLOO. The paucity of evidence from the analysis of fish pathology (e.g., fin rot, tumors, and lesions) or the accumulation of contaminants in fish tissues also indicate that the San Diego fish community remains healthy and is not adversely affected by anthropogenic sources. Consequently, there is presently no evidence of significant long-term impacts on sediment quality or biotic communities in the coastal region off San Diego.

General Introduction

Chapter 1: General Introduction

INTRODUCTION

Treated effluent from the City of San Diego E.W. Blom Point Loma Wastewater Treatment Plant (PLWTP) is discharged to the Pacific Ocean through the Point Loma Ocean Outfall (PLOO) according to requirements set forth in Order No. R9-2002-0025, National Pollutant Discharge Elimination System (NPDES) Permit No. CA0107409. The above Order and associated Monitoring and Reporting Program (MRP No. R9-2002-0025) were adopted by the San Diego Regional Water Quality Control Board (RWQCB) on April 10, 2002. During 2003, the monitoring and reporting requirements for the Point Loma region were further modified with the adoption of Addendum No. 1 to Order/MRP No. R9-2002-0025, NPDES Permit No. CA0107409. The provisions established in Addendum No. 1 became effective August 1, 2003, thus superceding and entirely replacing all prior receiving waters monitoring requirements for the PLWTP. Addendum No. 1 is available online from the RWQCB (http://www.swrcb.ca.gov/ rwqcb9/orders/order_files/ r9-2002-0025.pdf).

The primary purpose of Addendum No. 1 was to modify the Point Loma monitoring and reporting program to incorporate recommendations of the *Model Monitoring Program for Large Ocean Discharges in Southern California* (Schiff et al. 2001). This addendum was developed through a collaborative process between the City of San Diego, the RWQCB, and the United States Environmental Protection Agency (USEPA), with additional input provided by several other governmental and non-governmental organizations. Overall, Addendum No. 1 modified the sampling plan for the Point Loma Ocean Monitoring Program to address a specific set of questions derived from the model monitoring program regarding ocean compliance, human health, and enviornmental assessment (**Box 1.1**). This modification included division of the monitoring program into three components: core monitoring, special strategic studies, and regional monitoring. The "core" monitoring program was derived from the pre-existing sampling regime and includes routine weekly, quarterly, and semi-annual sampling of various environmental parameters (**Table 1.1**). The major changes to the sampling program are summarized in **Appendix A** of this report. The amended permit includes plans to perform adaptive or special strategic process studies each year as determined by the City in coordination with the Executive Officer of the RWQCB and the USEPA. For example, the special studies approved for Year 1 of the permit include a comprehensive scientific review of the ocean monitoring program, the design of a broad sediment mapping study for the region, and continued participation in a remote sensing project of the entire San Diego coast. The new permit also mandates participation in regional sampling efforts of the entire Southern California Bight (SCB), such as the original SCB 1994 Pilot Project and subsequent 1998 and 2003 SCB Regional Monitoring Programs (i.e., Bight´98 and Bight´03, respectively).

The MRP for Point Loma defines the requirements for monitoring the receiving water environment around the PLOO, including the sampling plan, compliance criteria, laboratory analyses, statistical analyses and reporting guidelines. All sampling conducted from January through July 2003 was compliant with Order No. R9-2002-0025 adopted on April 10, 2002, while sampling from August through December 2003 was compliant with changes set forth in Addendum No. 1. For ease of presentation, the data reported herein emphasize the MRP that became effective on August 1, 2003. This presentation reflects the main objectives of the ocean monitoring program, which are to provide data that satisfy the requirements of the NPDES permit, demonstrate compliance with the 2001 California Ocean Plan, detect movement and dispersion of the wastewater field, and identify any biological or chemical changes that may be associated with wastewater discharge.

Box 1.1

Managerial questions from the Model Monitoring Program (*italics*) and the resulting monitoring questions used to develop the modified receiving waters monitoring program for the Point Loma Ocean Outfall (PLOO) adopted in Addendum No. 1 to Order/MRP No. R9-2002-0025, NPDES Permit No. CA0107409 on August 1, 2003.

MICROBIOLOGICAL MONITORING

Does sewage effluent reach water contact zones?

Are densities of bacteria in water contact zones below levels that will ensure public safety?

PLOO Shoreline Microbiology Monitoring: Ocean Compliance & Public Health Issues

Does the ocean water along the shoreline near the outfall meet California Ocean Plan (COP) bacteriological water-contact standards?

Are bacterial densities along the shoreline below levels that ensure public safety?

PLOO Kelp Bed Water Quality Monitoring: Ocean Compliance Issues

Does the ocean water in the Point Loma kelp bed meet COP bacteriological water-contact standards?

WATER QUALITY MONITORING

Are water column physical and chemical parameters within ranges that ensure protection of the ecosystem?

What is the fate of the discharge plume?

PLOO Offshore Water Quality Monitoring: Ecosystem Protection

Are water column physical and chemical parameters within ranges that ensure protection of the ecosystem?

Are COP limits for pH, dissolved oxygen, and natural light being met?

PLOO Offshore Water Quality Monitoring: Fate of the Wastewater Plume

What is the fate of the wastewater plume?

SEDIMENT MONITORING

Are sediments in the vicinity of the discharge impaired? If so, what is the spatial extent of the impairment?

Are sediment conditions changing over time?

PLOO Benthic Monitoring: Local Trends Program

Is the benthos (sediments & animals) in the vicinity of the discharge site impaired?

Are benthic conditions off Point Loma changing over time?

Are observed changes associated with outfall effects, other anthropogenic impacts, or natural factors?

PLOO Benthic Monitoring: Local Mapping Program

Are sediments in the vicinity of the discharge site impaired?

What is the spatial extent (and nature) of that impairment?

PLOO Benthic Monitoring: Regional Program

What is the extent and magnitude of ecological change in the Southern California Bight (SCB)?

How do conditions compare among selected geographic regions of the SCB?

What is the relationship between biological responses and contaminant exposure?

FISH AND EPIBENTHIC INVERTEBRATE MONITORING

Is the health of fish populations and communities impaired?

Are fish populations and communities changing over time?

Is fish tissue contamination changing over time?

PLOO Demersal Fish & Invertebrate Monitoring: Regional Program

Is the health of demersal fish and invertebrate communities in the SCB changing over time?

PLOO Bioaccumulation Monitoring: Local Trends Program

Is fish tissue contamination near the PLOO changing over time?

Is fish tissue contamination near the LA-5 disposal site changing over time, and how does data from that known impact area compare to data from near the PLOO?

PLOO Bioaccumulation Monitoring: Local Seafood Safety

Are seafood tissue contaminants changing over time in fish collected near the PLOO by sportfishers?

Table 1.1

Receiving waters sampling effort for the Point Loma Ocean Outfall monitoring program adopted in Addendum No. 1 to Order/MRP No. R9-2002-0025, NPDES Permit No. CA0107409 on August 1, 2003. Resamples and QA/QC (duplicate/split) samples are excluded.

Monitoring Component	Location	Number of Stations/Zones	Sample Type	No. Ocean Samples/Site	Sampling Frequency	Sampling Times/Yr	No. "Ocean" Samples/Yr	Parameters	No. "Data" Samples/Yr	Notes
Water Quality	shore (n=8)	8	Seawater - Bacti	1	weekly	52	416	T, F, E [a]	1248	1 sample/stn
Microbiology & Oceanographic Conditions	kelp (n=8)	8	Seawater - Bacti	3	5x/month	60	1440	T, F, E [a]	4320	3 depths/stn
		8	CTD	1	5x/month	60	480	CTD profile [c]	3840	1 cast/stn
	special study kelp (n=3)	3	Seawater - Bacti	1	5x/month	60	180	T, F, E [a]	540	Non-NPDES sites, bottom depths only
	offshore (n=36)	3	Seawater - Bacti	3	quarterly	4	36	T, F, E [b]	108	3 depths/stn (18-m stns)
		11	Seawater - Bacti	3	quarterly	4	132	T, F, E [b]	396	3 depths/stn (60-m stns)
		11	Seawater - Bacti	4	quarterly	4	176	T, F, E [b]	528	4 depths/stn (80-m stns)
		11	Seawater - Bacti	5	quarterly	4	220	T, F, E [b]	660	5 depths/stn (98-m stns)
		36	CTD	1	quarterly	4	144	CTD profile [c]	1152	1 cast/stn
Sediments	offshore (n=22)	22	Grab	1	semiannual (Jan, Jul)	2	44	sediment constituents [d]	396	1 grab/stn
Benthic Macrofauna	offshore (n=22)	22	Grab	2	semiannual (Jan, Jul)	2	88	infaunal community	88	2 replicate grabs/stn
Demersal Fishes & Megabenthic Invertebrates	offshore (n=6)	6	Trawl	1	semiannual (Jan, Jul)	2	12	fish/invert communities	12	1 trawl/stn
Bioaccumulation	offshore trawl (n=6 sites, 4 zones)	4	Trawl	9	annual (Oct)	1	36	tissue contaminants [e]	144	3 composite samples/ 3 species/zone (liver tissues)
Fish Tissues	offshore rig fishing (n=2 sites/zones)	2	Hook & Line/Trap	3	annual (Oct)	1	6	tissue contaminants [f]	24	3 composite samples/zone (muscle tissues)

a T, F, E = total coliform, fecal coliform, and enterococcus bacteria (n = 3 parameters); T, F, E = all NPDES mandated
b T, F, E = total coliform, fecal coliform, and enterococcus bacteria (n = 3 parameters); E = NPDES mandated, T & F = voluntary
c CTD profile = depth, temperature, salinity, dissolved oxygen, light transmittance (transmissivity), chlorophyll *a*, pH, density (n = 8 parameters)
d Sediment constituents = sediment grain size, total organic carbon, total nitrogen, sulfides, metals, PCBs, chlorinated pesticides, PAHs, BOD (n = 9 parameter categories; see NPDES permit for complete list of chemical constituents; BOD = voluntary)
e Fish tissue contaminants (liver) = lipids, PCBs, chlorinated pesticides, metals (n = 4 parameter categories; see NPDES permit for complete list of chemical constituents); 3 metals analyzed (mercury, arsenic, selenium)
f Fish tissue contaminants (muscle) = lipids, PCBs, chlorinated pesticides, metals (n = 4 parameter categories; see NPDES permit for complete list of chemical constituents); 9 metals analyzed (arsenic, cadmium, chromium, copper, lead, mercury, selenium, tin, zinc)

BACKGROUND

The City of San Diego began operation of the wastewater treatment plant and original ocean outfall off Point Loma in 1963, at which time treated effluent was discharged approximately 3.9 km offshore at a depth of about 60 m (200 ft). From 1963 to 1985, the PLWTP operated as a primary treatment facility, removing approximately 60% of the total suspended solids (TSS) by gravity separation. Since then, considerable improvements have been made to the treatment process. For example, the City began upgrading the process to advanced primary treatment (APT) in mid-1985, with full APT status being achieved by July of 1986. This improvement involved the addition of chemical coagulation to the treatment process, and resulted in an increased TSS removal of about 75%. Since 1986, treatment has been further enhanced with the addition of several more sedimentation basins, expanded aerated grit removal, and refinements in chemical treatment. These enhancements have resulted in consistently lower mass emissions from the plant, with TSS removals of greater than 80%. In addition, the PLOO was extended 3.3 km further offshore in the early 1990s in order to prevent intrusion of the wastewater plume into nearshore waters and thus comply with standards set forth in the California Ocean Plan for water contact sports areas. Construction of the outfall extension was completed in November 1993 at which time discharge was terminated at the original 60-m site. The outfall presently extends approximately 7.2 km offshore to a depth of 94 m (310 ft), where the pipeline splits into a Y-shaped multiport diffuser system. The two diffuser legs extend an additional 762 m to the north and south, each terminating at a depth of about 98 m (320 ft) near the edge of the continental shelf.

The average daily flow of effluent through the PLOO in 2003 was 170 million gallons per day (mgd) or 643 million liters per day (mLd), ranging from a minimum of 149 mgd (564 mLd) to a maximum of 223 mgd (844 mLd). This is similar to the average flow of 169 mgd during 2002. TSS removal averaged about 85% during 2003, with the total mass emissions of 9,847 mt/yr (see City of San Diego 2004b).

RECEIVING WATERS MONITORING

Prior to 1994, the City conducted an extensive ocean monitoring program off Point Loma centered around the original 60-m discharge site. This program was subsequently modified and expanded with the construction and operation of the deeper outfall. Data from the last year of regular monitoring near the original inshore site are presented in City of San Diego (1995b), while the results of a 3-year recovery study for that area are summarized in City of San Diego (1998). From 1991 through 1993, the City also conducted a voluntary "predischarge" study in the vicinity of the new site in order to collect baseline data prior to the discharge of effluent in these deeper waters (City of San Diego 1995a, 1995b). Results of NPDES-mandated monitoring for the extended PLOO from 1994 through 2002 are available in previous annual receiving waters monitoring reports (e.g., City of San Diego 2003b). Additionally, the City has participated in a number of regional and other monitoring efforts throughout the Southern California Bight that have provided useful background information for the entire region (e.g., SCBPP 1998, City of San Diego 1999, 2000, 2001, 2002, 2003a, Bight'98 Steering Committee 2003).

The sampling area off Point Loma presently extends from La Jolla southward to Imperial Beach, and from the shoreline seaward to a depth of about 116 m (380 ft). Fixed sites are arranged in a grid surrounding the outfall, and are monitored in accordance with a prescribed sampling schedule. The monitoring program may be divided into the following major components, each comprising a separate chapter in this report: (1) Oceanographic Conditions; (2) Microbiology; (3) Sediment Characteristics; (4) Macrobenthic Communities; (5) Demersal Fishes and Megabenthic Invertebrates; (6) Bioaccumulation of Contaminants in Fish Tissues. Detailed information concerning station locations, sampling equipment, analytical techniques and quality assurance procedures are included in annual Quality Assurance Manuals for the City's Ocean Monitoring Program (e.g., City of San Diego 2004a). The raw data, detailed methodologies, completed reports, and other pertinent information submitted to the USEPA and the RWQCB throughout the year will be available online at the City's Metropolitan Waste Water Department website (http://www.sandiego.gov/mwwd).

This report summarizes the results from the receiving waters monitoring conducted off Point Loma from January through December 2003. In addition, the data were compared to the results from previous years in order to examine long-term patterns of change in the region. In addition, results from the continuing coastal remote sensing study of the San Diego/Tijuana Region that is jointly funded by the City, San Diego RWQCB, and the International Boundary and Water Commission have been incorporated into the water quality sections of this report (Chapters 2 and 3). A glossary of technical terms has also been added.

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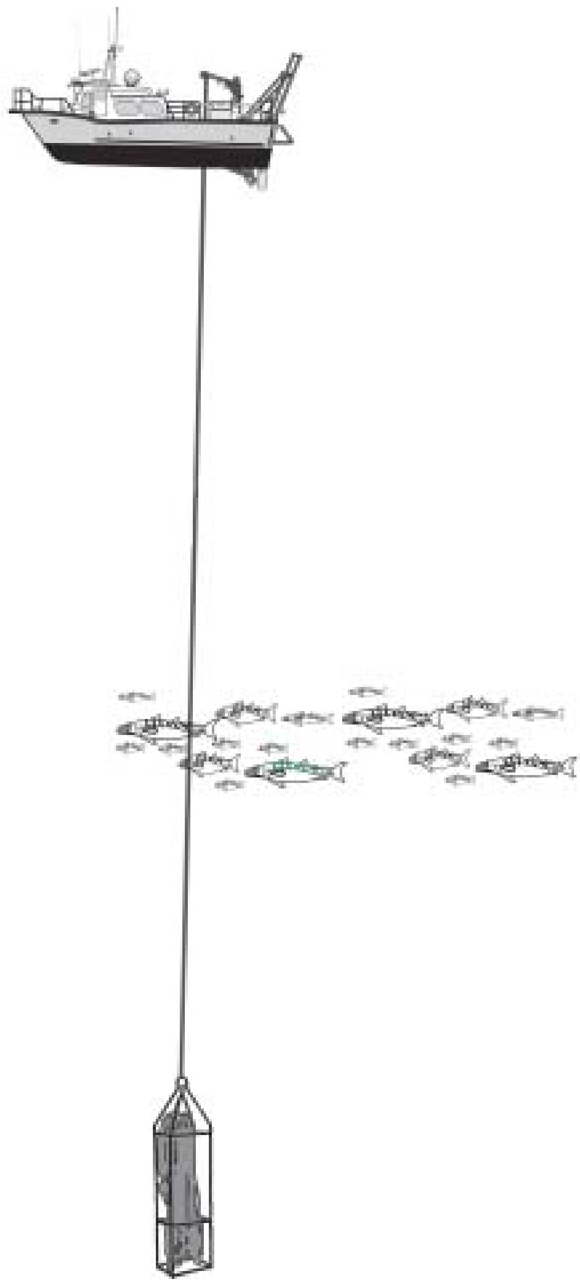
Oceanographic Conditions



Chapter 2. Oceanographic Conditions

INTRODUCTION

Measurements of physical and chemical parameters such as water temperature, salinity, density, and dissolved oxygen, are important components of ocean monitoring programs since many of these properties can affect the mixing potential of the water column. Analysis of the spatial and temporal variability of these parameters may also elucidate patterns of water mass movement. Consequently, such measurements and analyses help determine: (1) deviations from expected patterns that may indicate the influence of any wastewater plume, and (2) the extent to which water mass movement or mixing reflects the dispersion/dilution potential for discharged materials. With a deep offshore discharge site, the fate of treated municipal wastewater is strongly determined by horizontal mixing through diffusion, currents and internal waves as well as vertical mixing through diffusion, upwelling, or storm events. Oceanographic properties of the water column influence the degree of stratification, and measurements of physical parameters can therefore characterize the vertical transport potential surrounding the Point Loma Ocean Outfall (PLOO). On the other hand, bacterial concentrations may provide the best indication of horizontal transport of discharged waters in the absence of current information in deep waters (see Chapter 3).

The City of San Diego regularly monitors oceanographic conditions off Point Loma in order to assess the influence of a variety of sources. For example, although water quality in the region is naturally variable, it is also subject to several natural and anthropogenic sources of contamination. These include inputs from San Diego Bay, Mission Bay, and the San Diego River, as well as discharged wastewater through the PLOO. This chapter contributes to the on-going investigation of possible impacts of the PLOO on the local marine environment by analyzing the oceanographic conditions that occurred during 2003, which in turn may help explain patterns of bacteriological occurrence off Point Loma (see Chapter 3).

MATERIALS and METHODS

Oceanographic measurements were collected by lowering a SeaBird conductivity, temperature and depth (CTD) instrument through the water column at fixed offshore sampling sites regularly throughout the year (**Figure 2.1**). Forty-nine offshore stations (designated “A”, “B”, “C”, and “E” in Figure 2.1a) were sampled monthly from January through July, usually over a three-day period each month. Due to a change in permit requirements (see Chapter 1, Appendix A), these stations were discontinued in July 2003, and quarterly sampling of 36 stations (designated “F” in Figure 2.1b) began in October.

These offshore stations were located in a grid pattern surrounding the outfall along the 9, 18, 47, 60, 80, 88, 98, and 116-m depth contours. Eight stations along the 9 and 18-m contours are located within the Point Loma kelp bed and subject to the water contact standards of the COP. These kelp stations (i.e., A1, A6, A7, and C4 through C8) were sampled for temperature and transmissivity an additional four times each month, for a total of five sampling events per month. Three other sites were also sampled voluntarily by the City in an offshore area near the original outfall diffusers (i.e., stations A11, A13, A17).

Water column profiles of temperature, salinity, density, pH, transmissivity (water clarity), chlorophyll *a*, and dissolved oxygen values were constructed for each station by averaging the values recorded over 1-m depth intervals during processing. Further details regarding the CTD data processing are provided in the City’s Quality Assurance Manual (City of San Diego 2004a). Visual observations of water color and clarity, surf height, human or animal activity, and weather conditions were also recorded at all stations at the time of sample collection.

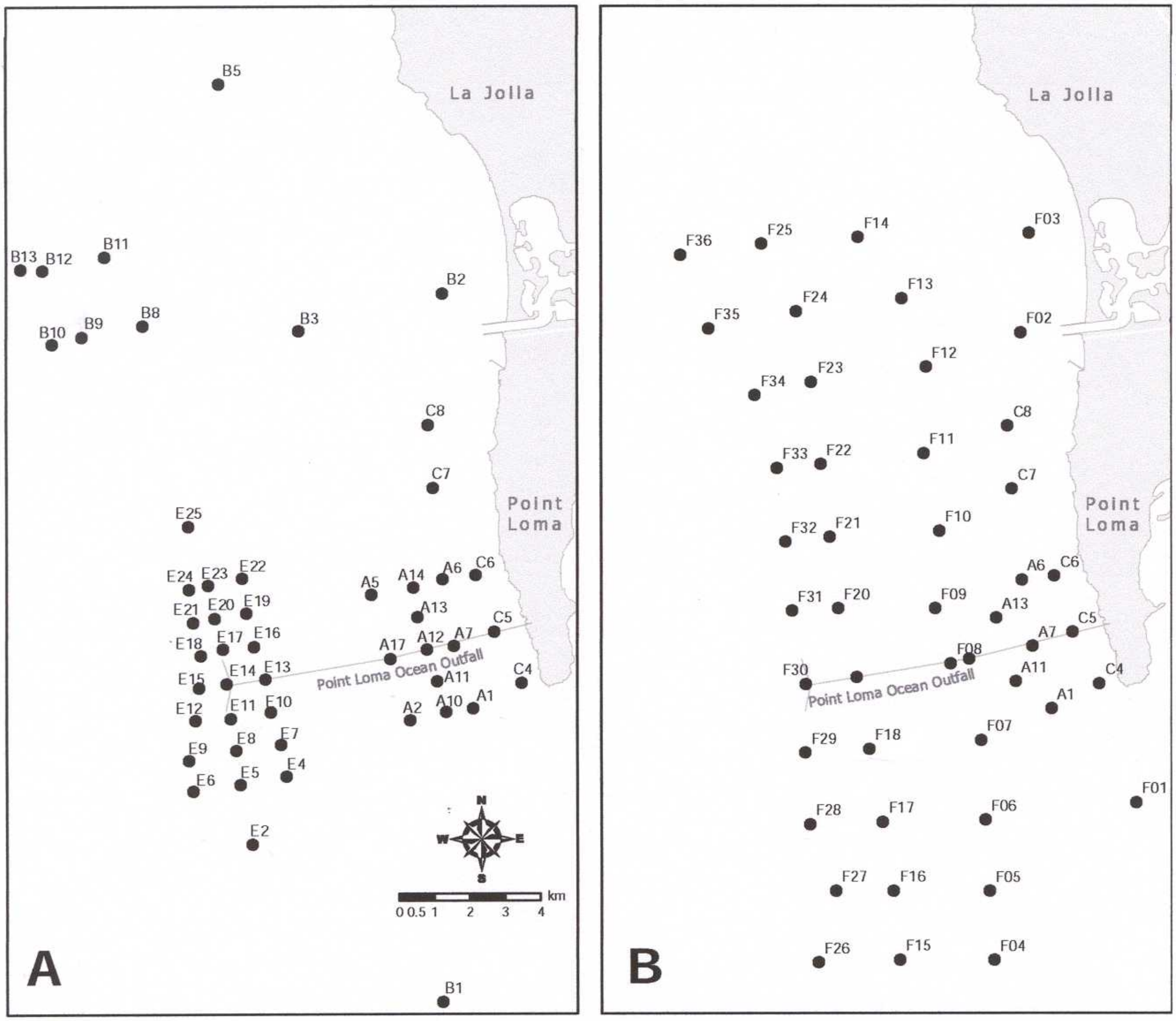


Figure 2.1
Locations of water quality monitoring stations where CTD casts are taken for the Point Loma Ocean Outfall Monitoring Program from January–July (A) and October (B) (see text).

RESULTS and DISCUSSION

Expected Seasonal Patterns of Physical and Chemical Parameters

The weather in southern California can be classified into two basic "seasons," wet (winter) and dry (spring through fall), and certain patterns in oceanographic conditions off Point Loma track these "seasons." For instance, temperatures are typically similar at surface and midwater depths during the winter months, but then diverge beginning in spring with differences becoming greatest in the mid- to late summer. In contrast, waters deeper than 88 m exhibit an opposite pattern, generally being warmest during winter and coldest throughout the spring and summer.

The typical winter conditions present during January and February each year are characterized by cold water temperatures and a high degree of homogeneity for all physical and chemical parameters. Although the upper and mid-level waters are typically well-mixed at these times, stormwater runoff due to heavy rainfall may periodically influence density profiles by causing a freshwater lens within nearshore surface waters. With minimal stratification of the water column, the chance that the wastewater plume could surface is highest during these winter months.

Usually in March or April a decrease in the frequency of winter storms brings about the transition of seasons. During the spring and early summer months, surface waters begin to warm and cause the return of a seasonal thermocline and pycnocline to coastal and offshore waters. Once the water column becomes stratified, minimal mixing conditions tend to remain throughout the dry summer and fall months. In October or November, cooler weather, reduced solar input, and increased storm activity lead to the return of a well-mixed, homogeneous water column that is characteristic of winter months. Analyses of oceanographic data collected off Point Loma over the past 26 years support this pattern.

Observed Seasonal Patterns of Physical and Chemical Parameters

In general, oceanographic conditions during 2003 followed normal seasonal patterns within the expected range of variability (**Table 2.1**). As the highlighted cells in Table 2.1 illustrate, the highest values for surface water density, salinity and temperature occurred in an almost successional pattern throughout the year. The highest densities occurred first, followed by the highest salinity values, and then finally by the highest temperature values in summer and fall. A similar pattern was noted in the surface waters of the South Bay region off the coast of San Diego (City of San Diego 2004b). The highest pH, dissolved oxygen and chlorophyll values, as well as the lowest transmissivity levels were likely influenced by increases in primary productivity that occurred at or near the time of sampling.

Thermal stratification generally followed the typical annual pattern (**Figure 2.2**) Since temperature is the main contributor to water column stratification in southern California (Dailey et. al. 1993), it is significant that bottom waters (≥88m) were at least 3°C colder than surface waters (≤2m) throughout the year. During January and February, for example, temperatures in the deeper waters ranged between 9.5 and 10.4°C, while surface temperatures ranged between 14.1 and 16.4°C. This thermal separation created a barrier to vertical exchange between deep and shallower water layers, which was evident even during the minimally stratified winter months.

Table 2.1

Quarterly average values of temperature (°C), salinity (ppt), density (δ/θ), dissolved oxygen (mg/L), pH, chlorophyll *a* (µg/L), and transmissivity (%), for top (≤2 m), mid-depth (10–20 m), and bottom (≥88 m) waters at all PLOO stations during 2003. Surface water parameters with the greatest impact on stratification or water clarity are highlighted.

		Jan	*Apr*	*Jul*	*Oct*
Temp	*Top*	15.4	14.5	18.0	18.4
	Mid	15.0	11.2	12.9	15.4
	Bot	11.5	9.8	10.1	11.2
Sal	*Top*	33.38	33.48	33.53	33.32
	Mid	33.38	33.67	33.55	33.27
	Bot	33.69	34.12	33.90	33.48
Dens	*Top*	24.63	24.90	24.14	23.89
	Mid	24.72	25.71	25.27	24.54
	Bot	25.66	26.29	26.08	25.56
DO	*Top*	7.2	7.9	7.9	8.7
	Mid	7.1	5.8	6.6	8.1
	Bot	4.4	2.5	2.9	5.1
pH	*Top*	8.1	8.1	8.2	8.3
	Mid	8.0	7.8	8.0	8.1
	Bot	7.8	7.6	7.6	7.8
XMS	*Top*	85.9	76.7	79.2	78.8
	Mid	87.7	88.3	82.9	87.7
	Bot	88.7	90.1	84.0	89.5
Chl *a*	*Top*	1.2	3.6	4.4	10.2
	Bot	0.3	0.6	1.3	1.4

Mid-level waters, on the other hand, had temperatures similar to surface waters during January and February. This lack of wintertime stratification is apparent in the single-station profiles and all-station volumetric interpolations for the temperature, density and dissolved oxygen data collected during January (**Figure 2.3**). As these plots show, the upper water column was well mixed during the winter months as indicated by relatively homogeneous physical and

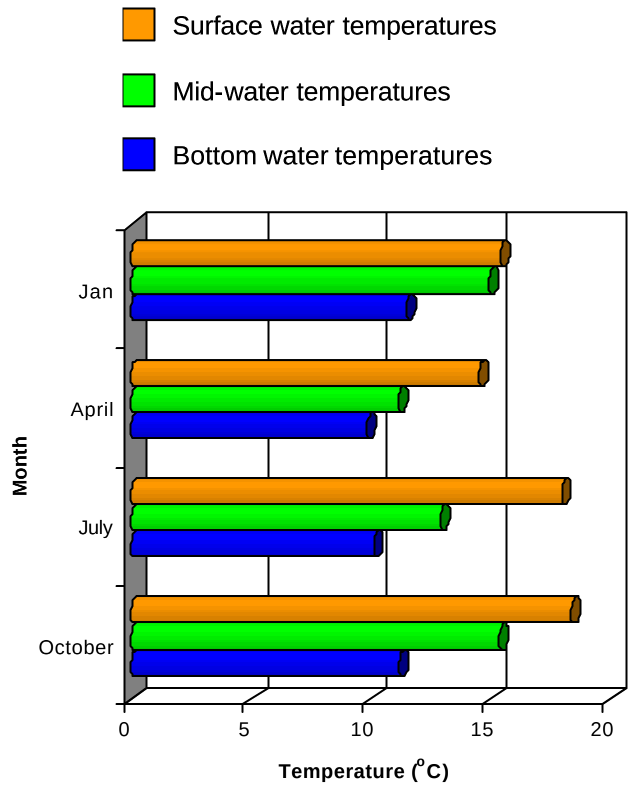


Figure 2.2

Average temperatures (°C) for surface (<2 m), mid-depth (10–20 m), and bottom (>88 m) waters during January, April, July, and October 2003.

chemical parameters. Mid-level water temperatures during this period ranged from 12.7 to 16.3°C, with the average difference between mid- and surface waters being less than 0.5°C.

Development of stratification between mid-level (i.e., the thermocline) and surface waters began in spring as mid-depth waters cooled to near bottom water temperatures and persisted throughout the summer. During May, June, July, and October, mid-water temperatures ranged from 10.2 and 19.6°C, and the difference between average surface and mid-water temperatures was at least 2°C and sometimes as great as 5°C (**Table 2.2**). The July profiles and volumetric plots illustrate the shallowness of the mixed layer that had developed by mid-summer (**Figure 2.4**). The thermocline was within the top 16 m of the water column during July, even at stations farthest from shore. However, some of the patchiness apparent in the July surface water values (in temperature, density and

Table 2.2

Average temperature differences between mid-depth (10–20 m) and surface waters (≤2 m) surrounding the PLOO during 2003.

	Difference in (°C)		
	Top vs. Mid	Top vs. Bottom	Mid vs. Bottom
January	0.45	3.93	3.47
April	3.37	4.68	1.31
July	5.08	7.87	2.79
October	3.01	7.21	4.20

dissolved oxygen levels) may indicate contributions from deeper, upwelled waters (Figure 2.4).

The average temperature difference between surface and bottom waters during the summer months was at least 7.5°C. During this period, bottom temperatures ranged between 9.5 and 11.6°C, while surface temperatures ranged between 13.4 and 20.6°C. The highest surface temperature for the year was 20.6°C, which was recorded on July 1 at station B12. As expected, the greatest disparity in temperature values between surface and deep waters occurred during the summer and early fall, following the normal cooling of deep waters and warming of surface waters that occurred in spring (Figure 2.2). The data from October show fairly uniform temperatures and density values in a deepening surface mixed layer (**Figure 2.5**). However, the data for dissolved oxygen show variability that was likely influenced by the red tide that enveloped the region in the late summer and early fall.

The red tide was caused by high abundance of the dinoflagellate *Lingulodinium polyedrum*. The extent of the bloom that engulfed waters off San Diego from August through October can be seen in a series of MODIS satellite images captured during that period (**Figure 2.6**). The plankton bloom was associated with the return of strong coastal upwelling that occurred region-wide. These conditions followed periods of downwelling that were prevalent during the winter of 2002 and early spring 2003 (Venrick et. al. 2003). Dinoflagellate blooms occurred all along the west coast

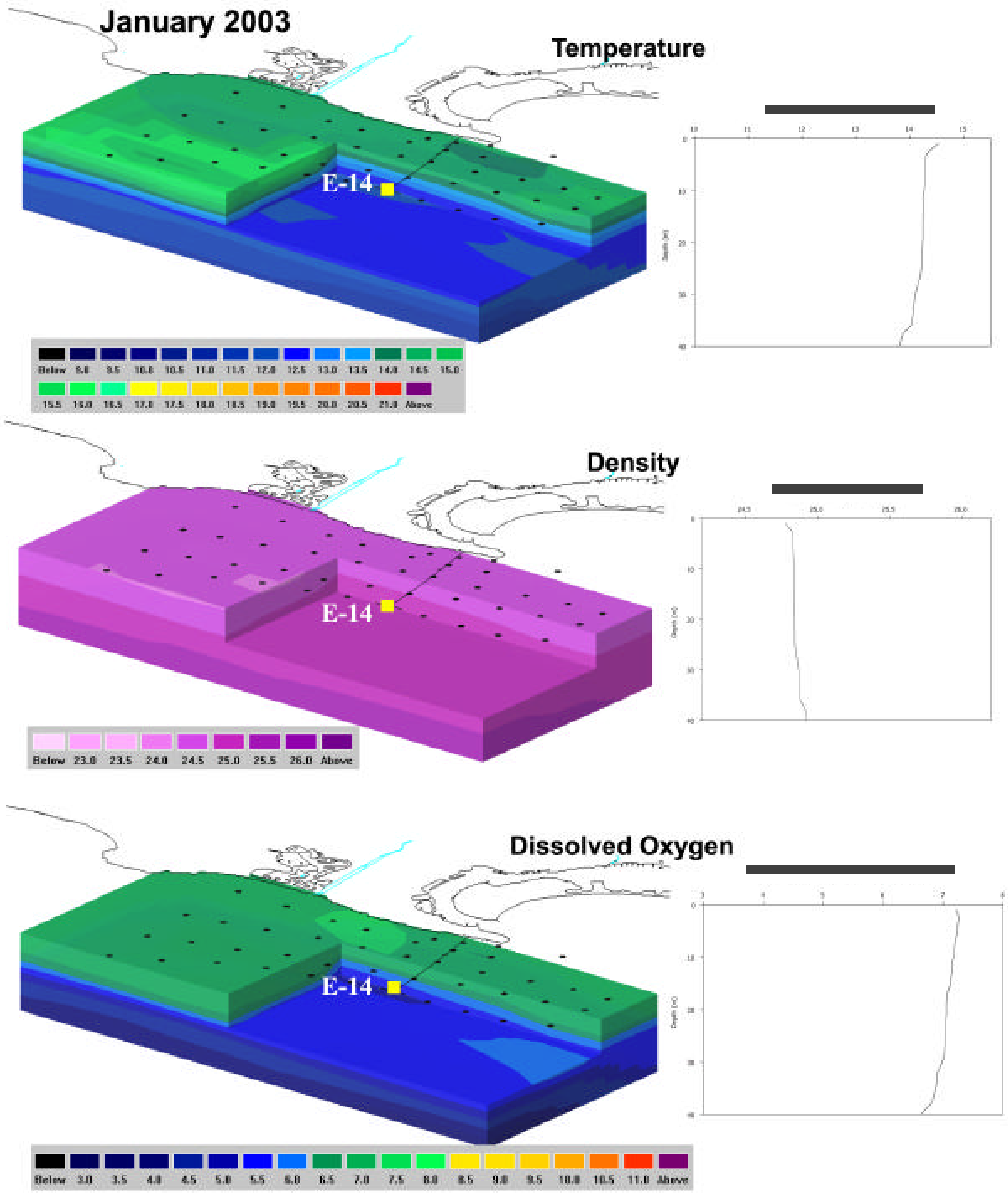


Figure 2.3

Interpolated volumetric (3D) plots of temperature, density (δ/θ), and dissolved oxygen at stations surrounding the PLOO on January 14, 15, and 16, 2003. Accompanying profiles illustrate these same parameters for offshore station E14 on January 15, 2003.

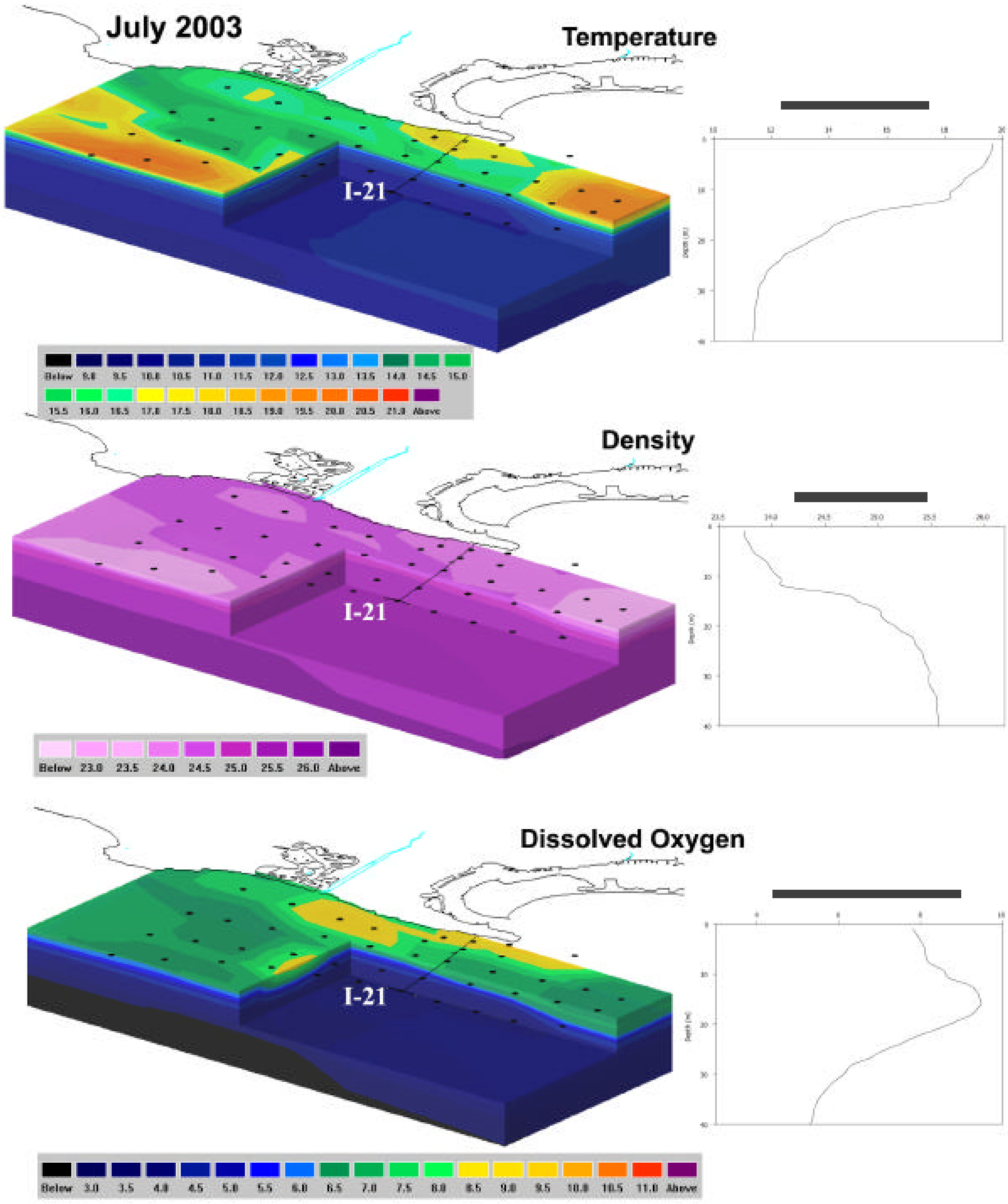


Figure 2.4

Interpolated volumetric (3D) plots of temperature, density (δ/θ), and dissolved oxygen at stations surrounding the PLOO on July 1, 2, 3, and 8, 2003. Accompanying profiles illustrate these same parameters for offshore station E14 on July 3, 2003.

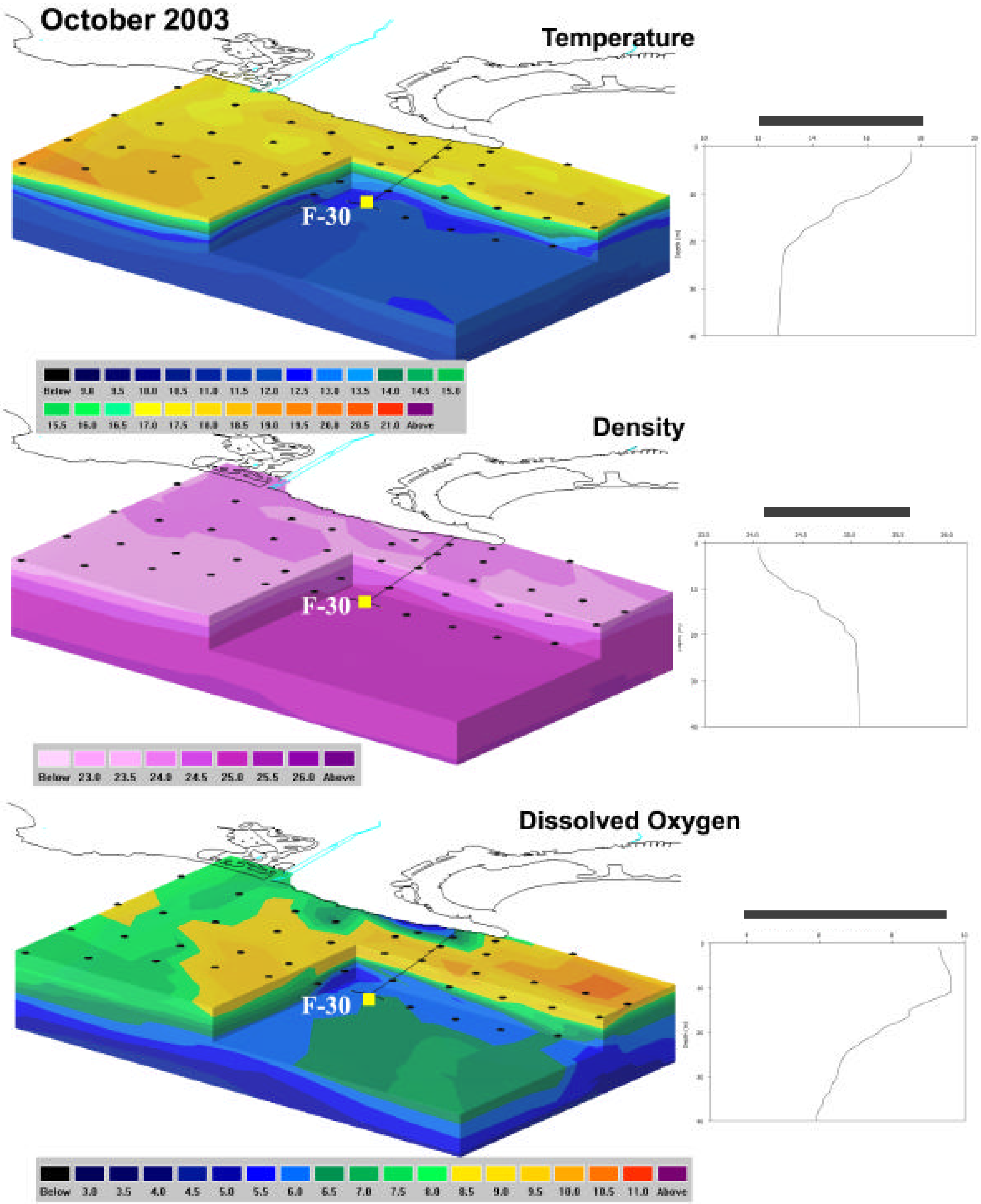


Figure 2.5

Interpolated volumetric (3D) plots of temperature, density (δ/θ), and dissolved oxygen at stations surrounding the PLOO on October 8, 9, and 10, 2003. Accompanying profiles illustrate these same parameters for offshore station F30 on October 9, 2003.

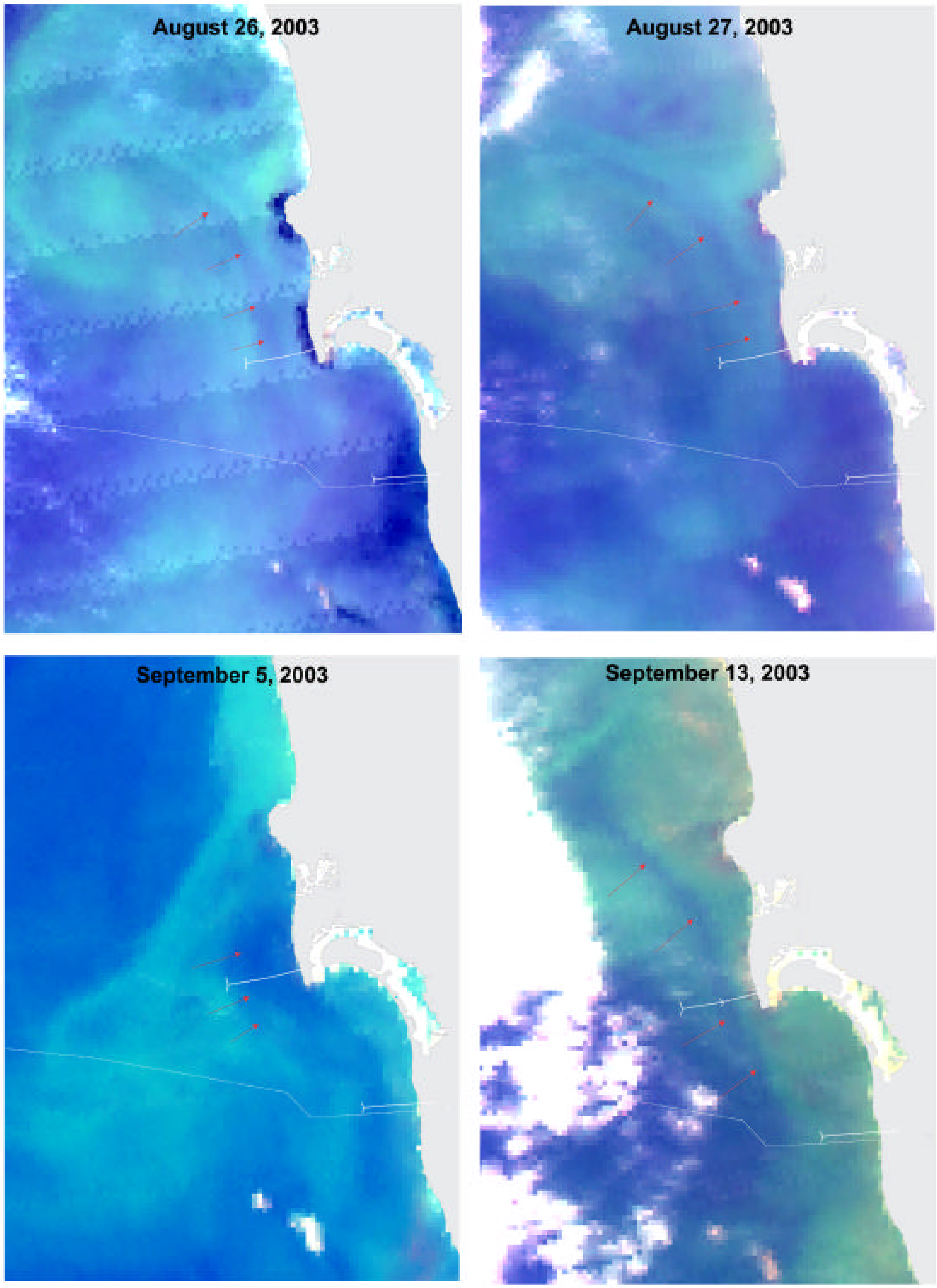


Figure 2.6

MODIS natural color satellite images from August 26 and 27, and September 5 and 13, 2003, showing the extent of the late summer dinoflagellate bloom. The color of the plankton bloom acts as a marker and illustrates water movement in the area. A north-south strip of lower plankton abundance may indicate a decoupling of water mass movement between the Point Loma nearshore region versus the deeper waters that surround the outfall discharge.

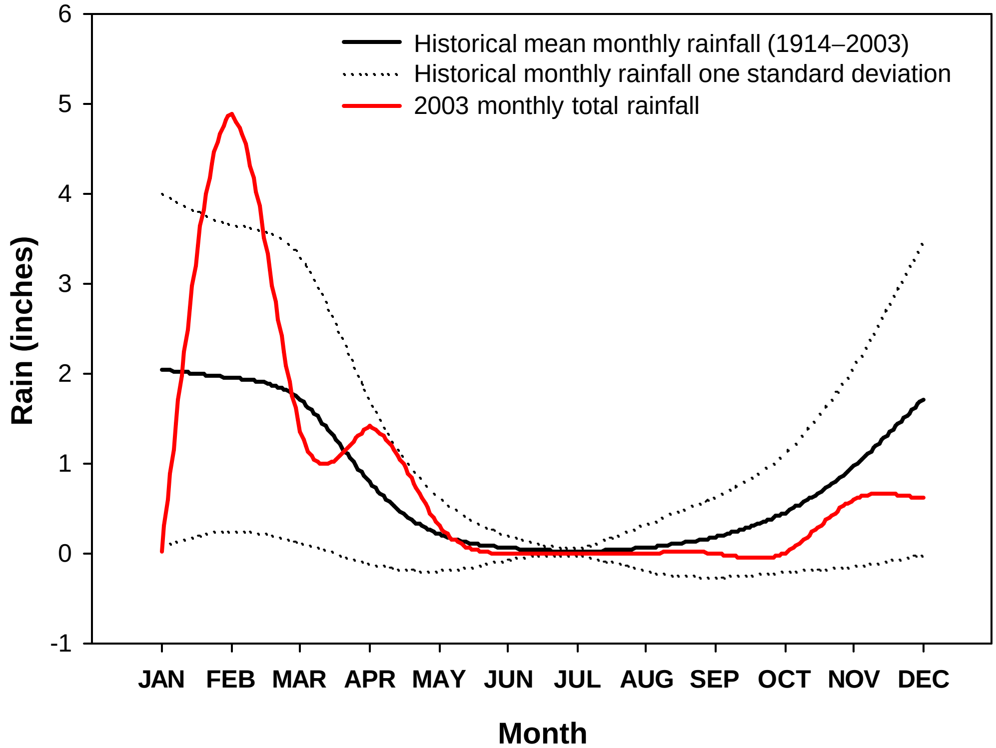


Figure 2.7

Monthly average rainfall at Lindbergh Field (San Diego, CA) for 2003 compared to normal monthly average rainfall for the historical period 1914 through 2003.

of the U.S. during 2003, although the southern California manifestation was particularly vast and intense. Several circumstances may have enhanced the local response including: heavy input of terrigenous material during late winter and early spring rains, localized upwelling as early as April, low winds and very calm conditions from summer through fall, and a shift from predominantly south/southwesterly to west/northwesterly winds during August and September.

As evident in the satellite images, the high plankton abundance in surface waters acted somewhat as a marker of water movement and clearly illustrated the typical north-south trend for currents in the region. An interesting feature visible in each image appears as dark line running roughly north-south about halfway along the Point Loma outfall pipe. This dark area indicates a lower abundance of plankton, which may be due to a shearing-induced nearshore-to-offshore decoupling of water mass movement just west of the Point Loma kelp beds. This pattern of water movement has been noted several times in reports of the ongoing remote sensing study in the area (e.g., Ocean Imaging 2003a, b, c). If this represents a consistent separation of flow patterns for nearshore and offshore waters, it seems unlikely that the wastewater field from the outfall could be transported shoreward.

Rainfall was lower than average during most months of the year, although abnormally heavy rains occurred in February and April (**Figure 2.7**) (NOAA/NWS 2004). Despite these periodic, heavy rains, there were no patterns in compromised water clarity that were clearly due to runoff. Transmissivity was fairly high at all stations most of the time, with 95% of the measurements indicating greater than 80% transmissivity. Even when chlorophyll levels were high in nearshore waters during October (see **Figure 2.8**), transmissivity was below 80% less than 4% of the time.

SUMMARY and CONCLUSIONS

In general, oceanographic conditions during 2003 followed normal seasonal patterns within the expected range of annual variability. For the most part, rainfall

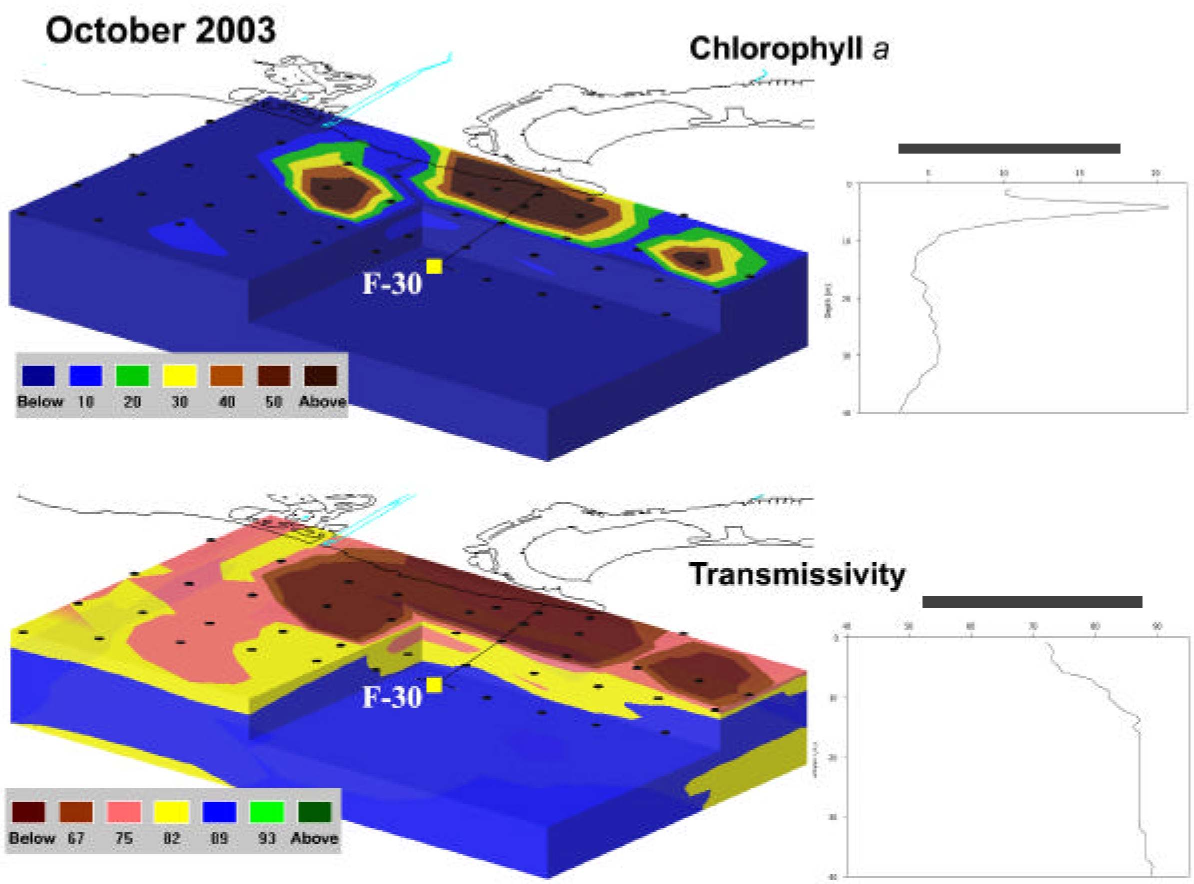


Figure 2.8

Interpolated volumetric (3D) plots of chlorophyll and transmissivity at stations surrounding the PLOO during October 8–10, 2003. Accompanying profiles illustrate these same parameters for station F30, on October 9, 2003.

fell within the range of long-term variability for each month, although the very heavy February rains were anomalous. The influx of freshwater during February, March and April was a likely contributor to density-dependent stratification in the early spring. This pycnocline provided some depth stratification in the upper water column prior to the development of strong thermal stratification during mid-summer, which then persisted through October.

Reduced transmissivity values were consistently found just offshore of the Point Loma beaches or near the mouths of San Diego Bay and Mission Bay. This suggests that most instances of compromised water clarity are due to sediment resuspension or embayment flushing events. In general, low transmissivity values were not well correlated with chlorophyll concentrations. October sampling did capture localized pockets of reduced water clarity measurements caused by a red tide that enveloped the region throughout the late summer and early fall.

Analysis of the physical water column properties off Point Loma provided no evidence that wastewater discharged via the PLOO in 2003 reached either inshore sites or surface waters. Even during the winter months when water column stratification was weakest, there was no indication that the wastewater plume reaching depths shallower than 40–60 m. These physical conditions will be important in the analysis of spatial patterns of bacterial concentrations to be discussed in the following chapter.

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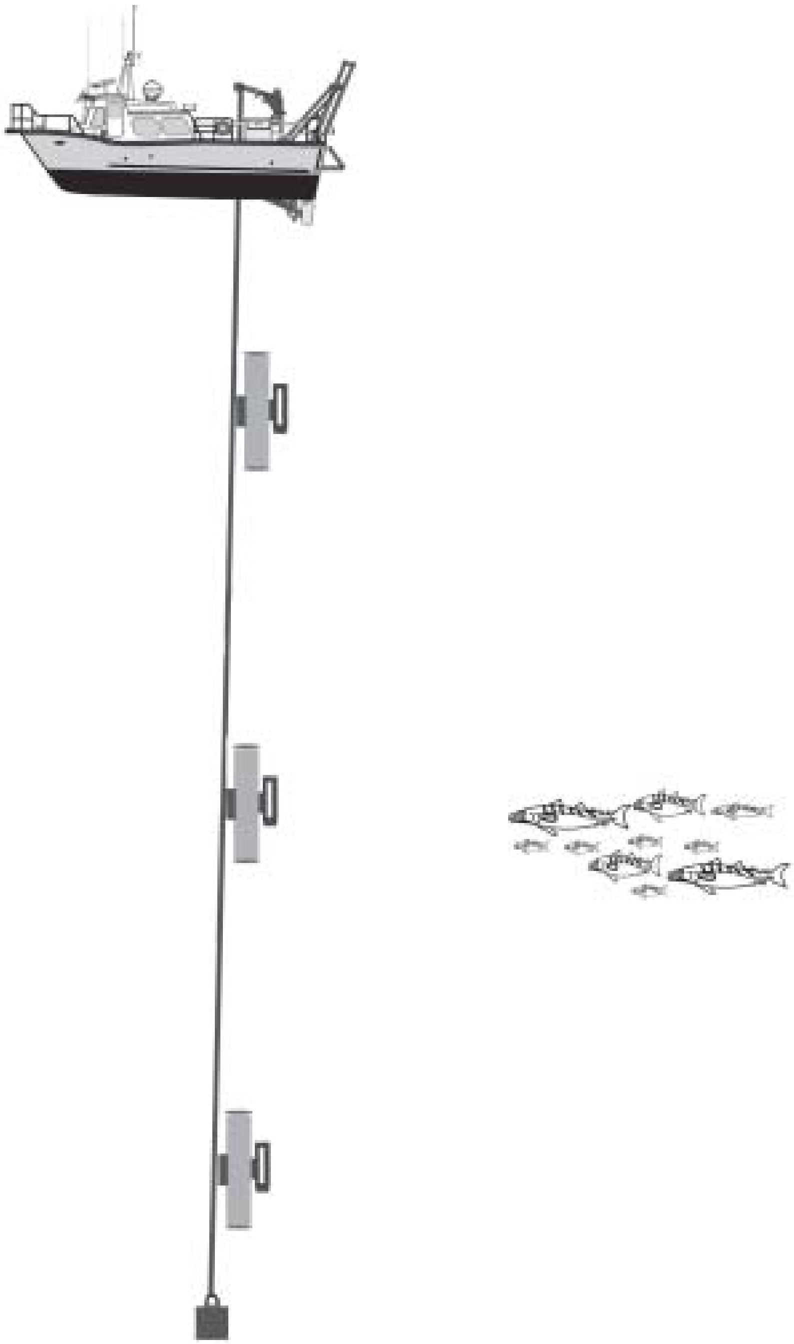
Microbiology



Chapter 3. Microbiology

INTRODUCTION

The City of San Diego performs shoreline and water column bacterial monitoring in the region surrounding the Point Loma Ocean Outfall (PLOO). The presence, absence, and abundance of bacteria, together with oceanographic data (see Chapter 2), can provide information about the movement and dispersion of wastewater discharged through the outfall. Analyses of these data may also identify point or non-point sources other than the outfall that contribute to bacterial contamination in the region. The PLOO monitoring program is designed to assess general water quality and demonstrate level of compliance with the California Ocean Plan (COP) as required by the NPDES discharge permit. This chapter summarizes and interprets concentrations of indicator bacteria collected during 2003.

MATERIALS and METHODS

Field Sampling

Water samples for bacterial analysis were collected at fixed shore and offshore sampling sites throughout the year (**Figure 3.1**). Sampling was conducted at shore stations D1 through D12 to monitor bacteria levels along public beaches. However, due to a change in the City's NPDES permit, stations D1, D2, D3, and D6 were discontinued after the July 31, 2003 while stations D10, D11, and D12 were added (see Chapter 1, Appendix A). Twenty-seven offshore stations (designated with "A", "B", "C", and "E" in Figure 3.1a) were sampled monthly from January through July. Quarterly sampling of 36 stations (designated with "F" in Figure 3.1b) began in October. Each monthly or

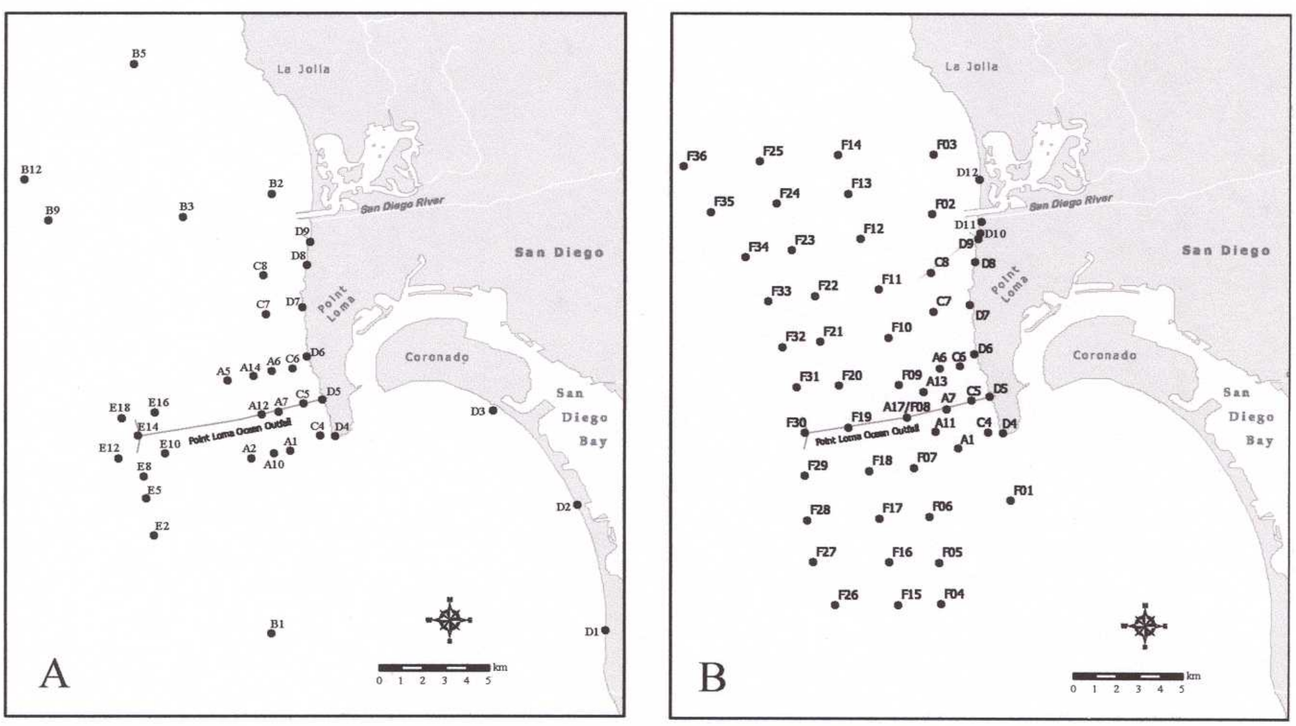


Figure 3.1
Locations of water quality monitoring stations where bacterial samples are taken for the Point Loma Ocean Outfall Monitoring Program from January–July (A) and October (B) (see text).

quarterly survey usually took place over a three-day period. All offshore stations were located in a grid pattern surrounding the outfall, along the 9, 18, 47, 60, 80, 88, 98, and 116-m depth contours. The number of samples taken at each station was depth-dependent and ranged from a minimum of three fixed depths sampled at the 9 and 18-m stations to a maximum of six fixed depths sampled at the 116-m stations. Eight stations along the 9 and 18-m contours are located within the Point Loma kelp bed and subject to the water contact standards of the COP. These kelp stations (i.e., A1, A6, A7, and C4–C8) were sampled for bacterial analysis a total of five times per month.

Seawater samples were collected in sterile 250 mL bottles from the shoreline at each shore station. Visual observations of water color and clarity, surf height, human or animal activity, and weather conditions were recorded at the time of collection. The seawater samples were then transported on ice to the City's Marine Microbiology Laboratory and analyzed to determine concentrations of total coliforms, fecal coliforms, and enterococcus bacteria.

Seawater samples from the offshore samples were analyzed for the same three bacterial parameters. The water samples were collected using either a series of Van Dorn bottles or a rosette sampler fitted with Niskin bottles. Aliquots for each analysis were drawn into appropriate sample containers. The samples were refrigerated onboard ship and then transported to the City's Marine Microbiology Laboratory for bacterial analysis. Visual observations of weather and water conditions were also recorded at the time of sampling.

Laboratory Analyses and Data Treatment

All bacterial analyses were performed within eight hours of sample collection in conformance with the membrane filtration techniques outlined in the City's Quality Assurance Manual (City of San Diego 2004). The Marine Microbiology Laboratory follows guidelines issued by the United States Environmental Protection Agency (USEPA) Water Quality Office, Water Hygiene Division and the California State Department of Health Services, Water Laboratory Approval Group with respect to sampling and analytical procedures (Bordner et al. 1978, Greenberg et al. 1992).

Colony counting, calculation of results, data verification, and reporting all follow guidelines established by the USEPA (see Bordner et al. 1978). Data are recorded in colony forming units (CFU). According to these guidelines, plates with bacterial counts above or below permissible counting limits were designated with greater than (>), less than (<), or estimated (e) qualifiers. These qualifiers were ignored and the counts were treated as discrete values during the calculation of compliance with COP standards and subsequent statistical analyses. Bacteriological benchmarks for receiving waters discussed in this report are >1,000 CFU/100 mL for total coliform values, >400 CFU/100 mL for fecal coliforms, and >104 CFU/100 mL for enterococcus bacteria. These benchmarks are used as reference points to distinguish elevated concentrations of bacteria, and should not be construed as compliance limits or as indicators of health risk.

Monthly mean densities of total, fecal, and enterococcus bacteria were calculated for each station, depth (offshore stations), and transect (offshore stations). In order to detect spatio-temporal patterns in bacteriological contamination, these data were evaluated relative to monthly rainfall and climatological data collected at Lindbergh Field (San Diego, CA) and remote sensing data collected by Ocean Imaging Corporation. Shore and kelp bed station compliance with COP bacteriological standards were summarized according to the number of days that each station was out of compliance with the 30-day total coliform, 10,000 total coliform, 60-day fecal coliform, and geometric mean standards (see Box 3.1). Bacteriological data for the offshore stations are not subject to COP standards; however, these data were used to examine spatio-temporal patterns in the dispersion of the waste field. In attempting to distinguish the waste field, contaminated waters were considered to have total coliform concentrations >1,000 CFU/mL and a fecal:total (F:T) ratio ≥0.1 (see CS-DHS 2000). Offshore station water quality samples that met these criteria were used as indicators of the waste field and considered indicative of contaminated waters.

Box 3.1

Bacteriological compliance standards for water contact areas, 2001 California Ocean Plan (CSWRCB 2001). CFU = colony forming units.

(1) *30-day total coliform standard* — no more than 20% of the samples at a given station in any 30-day period may exceed a concentration of 1,000 CFU/100 mL.

(2) *10,000 total coliform standard* — no single sample, when verified by a repeat sample collected within 48 hrs, may exceed a concentration of 10,000 CFU/100 mL.

(3) *60-day fecal coliform standard* — no more than 10% of the samples at a given station in any 60-day period may exceed a concentration of 400 CFU/100 mL.

(4) *geometric mean* — the geometric mean of the fecal coliform concentration at any given station in any 30-day period may not exceed 200 CFU/100 mL, based on no fewer than five samples.

Quality assurance tests were performed routinely on water samples to insure that sampling variability did not exceed acceptable limits. Duplicate and split field samples were routinely collected and processed by laboratory personnel to measure sample and analyst variability, respectively. Results of these procedures were reported in the Quality Assurance Manual (City of San Diego 2004).

RESULTS and DISCUSSION

Compliance with California Ocean Plan Standards – Shore and Kelp Bed Stations

California Ocean Plan (COP) bacterial standards for shore and kelp stations are displayed in **Box 3.1**. The only incidences of non-compliance with these standards occurred at stations along the shoreline. All of the shore stations were 100% compliant with the geometric mean standard. In contrast, stations D1 and D2 exceeded the 10,000 coliform standard once each on February 14, and several stations exceeded the 30-day total and 60-day fecal standards on a sporadic basis (**Table 3.1**). All water samples collected at the kelp bed stations were compliant with the four COP standards

Shore stations D3–D12 were compliant with the 30-day total coliform standard over 80% of the time (Table 3.1). In contrast, stations D1 and D2, located within an area influenced by discharge from the Tijuana River, were compliant with these standards 65% and 71% of the time, respectively. Similarly, stations from Point Loma northward (D4–D12) were compliant with the 60-day fecal coliform standard over 85% of the time, while the stations located along Imperial Beach (D1–D3) were compliant less frequently (i.e., 57–72% compliance). Generally, the incidences of non-compliance followed the periods of heaviest rainfall (see **Table 3.2**). Exceedences of the 60-day fecal coliform standard at stations D1 and D2 from February through April were caused by three incidences of elevated fecal coliforms at each station: once in February and twice in March. Station D3 had only one instance of elevated fecal coliforms, which occurred in February.

Spatial and Temporal Trends – Shore Stations

Bacterial concentrations along the shoreline in 2003 were highest during the periods of heavy rainfall (Table 3.2). Average concentrations of the three indicator bacteria were much higher in February and March than during the rest of the year. For example, 14 of the 18 samples with total coliforms >1,000 CFU/100 mL were collected in February and March, seven of which

Table 3.1

Summary of compliance with California Ocean Plan water contact standards for PLOO shore stations during 2003. The values reflect the number of days that each station exceeded the 30-day total and 60-day fecal coliform standards. Shore stations are listed left to right from south to north. Sampling at stations D1, D2, D3 and D6 ceased in July 2003, coincident with the start of sampling at stations D10, D11, and D12 (see text).

30-Day Total Coliform Standard

Month	# of possible sampling days	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
January	31	0	0	0	0	0	0	0	0	0			
February	28	15	15	15	0	0	0	15	15	0			
March	31	31	31	15	0	0	0	15	31	0			
April	30	15	15	0	0	0	0	0	15	16			
May	31	0	0	0	0	0	0	0	0	14			
June	30	0	0	0	0	0	0	0	0	0			
July	31	13	0	0	0	0	0	0	0	0			
August	31				0	0		0	0	0			
September	30				0	0		0	0	0			
October	31				0	0		0	0	0	0	0	0
November	30				0	0		0	6	0	0	0	0
December	31				0	0		0	0	0	0	0	0
Compliance (%)		65	71	86	100	100	100	92	82	92	100	100	100

60-Day Fecal Coliform Standard

Month	# of possible sampling days	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
January	31	0	0	0	0	0	0	0	0	0			
February	28	15	15	15	0	0	0	0	0	0			
March	31	31	31	31	0	0	0	0	0	0			
April	30	30	30	14	0	0	0	0	0	0			
May	31	14	15	0	0	0	0	0	0	0			
June	30	0	0	0	0	0	0	0	0	0			
July	31	0	0	0	0	0	0	0	0	0			
August	31				0	0		0	0	0			
September	30				0	0		0	0	0			
October	31				0	0		9	17	0			
November	30				0	0		26	26	0	0	0	0
December	31				0	0		1	1	0	0	0	0
Compliance (%)		58	57	72	100	100	100	90	88	100	100	100	100

also had elevated fecal coliform densities (i.e., >400 CFU/100 mL). The other four relatively high values for total coliforms occurred in April (station D9), July (station D1), November (station D8), and December (station D5); however, none of these were associated with elevated fecal coliform densities.

The stations to the south had higher mean densities of indicator bacteria relative to those stations located along the Point Loma Peninsula (Table 3.2). For example, the three southernmost stations (D1, D2, and D3) accounted for all seven of the samples with elevated total and fecal coliforms mentioned above. While stations located along the Point Loma Peninsula occasionally had elevated total coliforms

Table 3.2

Mean total coliform, fecal coliform and enterococcus densities (CFU per 100 mL) at PLOO shore stations by station, month, and year (2003). Stations are listed left to right in order from south to north. Rainfall (in inches) was measured at Lindbergh Field, San Diego, CA.Sampling at stations D1, D2, D3 and D6 ceased in July 2003, coincident with the start of sampling at stations D10, D11, and D12 (see text).

Month (rainfall)	**Station** n	**D1** 22	**D2** 22	**D3** 20	**D4** 42	**D5** 42	**D6** 17	**D7** 42	**D8** 43	**D9** 43	**D10** 23	**D11** 23	**D12** 23	Mean
January	Total	7	3	5	3	6	2	3	100	50	–	–	–	20
(0.02)	Fecal	5	3	2	2	2	2	2	5	2	–	–	–	3
	Entero	13	2	3	2	2	2	4	2	4	–	–	–	4
February	Total	16000	15000	8017	72	300	300	1600	1525	1000	–	–	–	6489
(4.88)	Fecal	6100	2725	501	38	24	4	50	43	24	–	–	–	1452
	Entero	7350	4400	1004	2	72	16	120	157	64	–	–	–	2007
March	Total	8040	3741	34	51	19	7	24	1388	51	–	–	–	2032
(1.36)	Fecal	1435	2495	9	15	7	2	8	29	15	–	–	–	623
	Entero	1868	1861	15	4	9	2	2	30	9	–	–	–	590
April	Total	26	9	26	2	2	4	5	26	634	–	–	–	117
(1.41)	Fecal	4	3	3	2	2	4	7	11	22	–	–	–	7
	Entero	16	2	3	2	2	2	7	8	2	–	–	–	5
May	Total	269	9	2	3	3	2	23	20	2	–	–	–	38
(0.30)	Fecal	12	2	2	2	2	2	5	3	2	–	–	–	4
	Entero	3	7	2	2	2	2	2	3	2	–	–	–	3
June	Total	21	15	39	104	26	14	26	39	14	–	–	–	33
(trace)	Fecal	5	3	3	2	3	4	2	12	2	–	–	–	4
	Entero	3	2	11	3	127	3	452	5	5	–	–	–	68
July	Total	688	30	125	39	50	27	31	39	14	–	–	–	116
(trace)	Fecal	33	2	6	4	22	3	6	5	2	–	–	–	9
	Entero	16	3	3	2	2	2	3	11	2	–	–	–	5
August	Total	–	–	–	27	14	–	38	88	17	38	95	64	47
(0.0)	Fecal	–	–	–	3	3	–	13	27	5	10	43	2	13
	Entero	–	–	–	9	3	–	5	17	3	10	9	2	7
September	Total	–	–	24	14	118	60	5	43	46	23	41		
(trace)	Fecal	–	–	–	3	3	–	23	13	3	10	17	5	9
	Entero	–	–	–	4	4	–	6	5	2	3	8	3	4
October	Total	–	–	–	56	17	–	177	245	21	58	35	12	77
(trace)	Fecal	–	–	–	53	7	–	143	193	6	21	11	5	54
	Entero	–	–	–	30	3	–	13	34	45	45	108	4	35
November	Total	–	–	–	13	20	–	26	935	9	42	6	14	113
(0.60)	Fecal	–	–	–	2	9	–	22	135	8	21	2	22	28
	Entero	–	–	–	10	3	–	3	112	72	18	2	6	28
December	Total	–	–	–	7	224	–	29	253	28	76	24	20	83
(0.61)	Fecal	–	–	–	3	69	–	9	49	6	37	17	6	25
	Entero	–	–	–	7	82	–	5	72	7	82	15	11	35
Annual	**Total**	3450	2224	843	32	55	29	86	373	85	53	38	25	
mean	**Fecal**	890	816	54	9	16	3	24	50	7	21	17	8	
	Entero	1099	825	106	7	28	3	50	40	17	35	26	6	

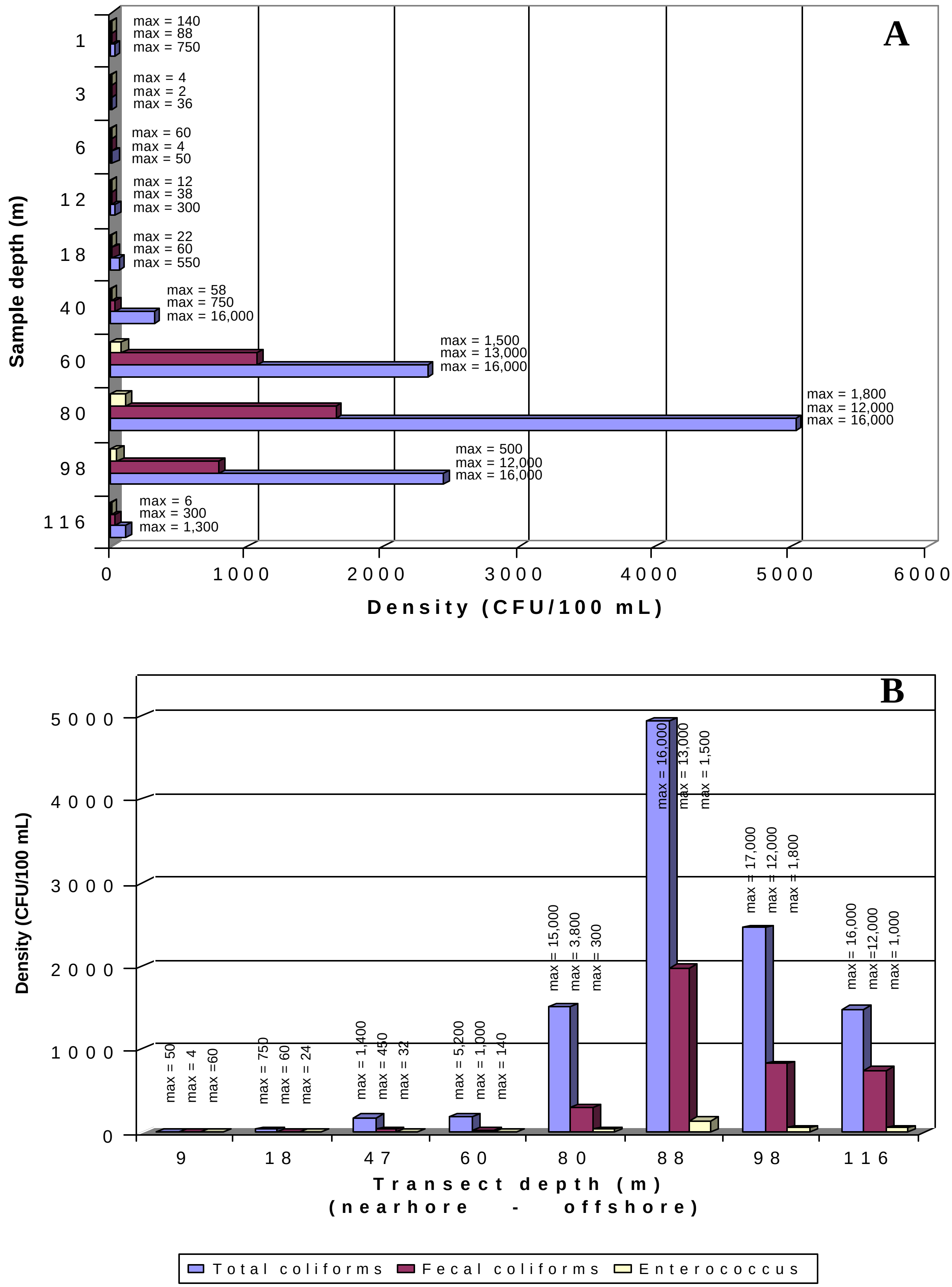


Figure 3.2
Mean and maximum bacteria densities (CFU/100 mL) at PLOO offshore monthly and quarterly sampling stations by sample depth (A) and by transect depth (B).

(i.e., 6 instances), none were associated with elevated fecal coliforms. In addition, fecal coliform concentrations along the Peninsula exceeded 400 CFU/100 mL only two occasions during the year (i.e., stations D7 and D8 in October), although neither instance was associated with elevated total coliforms.

Spatial and Temporal Trends – Kelp and Offshore Stations

There was little evidence that discharged wastewater reached surface waters in 2003 (**Figure 3.2a**). Total coliform concentrations in surface and subsurface waters (1–18 m) ranged from non-detectable levels to 750 CFU/100 mL throughout the year. Moreover, all surface and subsurface fecal coliform densities were <90 CFU/100 mL. In contrast, average total coliform concentrations ranged between 2,315 and 5,018 CFU/100 mL at depths between 60 and 98 m. Ninety-five percent of the samples with F:T coliform ratios >0.1 came from this depth range. The other 5% came from samples collected at depths of 40 and 116 m. This pattern suggests that the stratified water column restricted the plume to mid- and deep-water depths throughout the year (see Chapter 2).

Similarly, there was little evidence that discharged wastewater impacted nearshore waters in 2003 (**Figure 3.2b**). Bacterial levels at the shallowest stations (i.e., 9–60 m depth transects) were much lower than those further from shore (i.e., 80–116 m depth transects). In addition, overall bacterial concentrations at the kelp bed stations were much lower than at the offshore stations (**Table 3.3**). Total and fecal coliform denisties in the 9 and 18-m transect samples were all below benchmark values of 1,000 and 400 CFU/100 mL, respectively. Approximately 90% of the samples with F:T coliform ratios >0.1 were from the four deepest station transects sampled during the year (i.e., 80–116 m).

Bacteriological data from the monthly and quarterly sampling at the offshore stations suggested that the waste field was occasionally detected well north and south of the PLOO, but was limited primarily to stations within a relatively small area around the discharge site. For example, samples with elevated bacterial concentrations were collected during every survey within approximately 2 km of the PLOO. This included samples from stations E8, E10, E12, E14, E16, E18, F19 in January through July, and F29, F30, and F31 in October. Over 62% of the samples with F:T ratios >0.1 were collected at these sites. In contrast, only 13% of the samples with similar ratios were detected at the northern sites (i.e., B5, B9, B12, F21–25, and F31–36), and these were limited primarily to the March, April, and October surveys. A similar percentage of samples was found south of the outfall (i.e., stations E2, E5, F15, F16, F17, F26, F27, and F28) in almost every survey. Collectively, these data suggest that the waste field was limited primarily to a limited area within the vicinity of the discharge site at depths greater than 60 m, but was occasionally carried a fair distance to the north and south.

Table 3.3
Mean bacteria densities (CFU per 100 mL) for January, April, July, and October quarterly sampling at PLOO kelp stations and offshore stations

Month	Bacteria	Kelp	Offshore
January	Total	47	1226
	Fecal	3	320
	Entero	2	13
April	Total	22	1241
	Fecal	5	375
	Entero	3	45
July	Total	16	1465
	Fecal	2	674
	Entero	2	45
October	Total	9	1626
	Fecal	3	477
	Entero	2	34

SUMMARY and CONCLUSIONS

Bacteriological data from water quality surveys of offshore stations suggest that discharge from the Point Loma Ocean Outfall (PLOO) rarely, if ever, impacted surface or nearshore recreational waters. Evidence of contamination along the shoreline and within the kelp bed during 2003 was minimal. When present, it was limited to shoreline stations, mostly during periods of heavy rainfall, and likely related to shore-based sources.

Water quality samples from the kelp bed stations were 100% compliant with all California Ocean Plan (COP) standards during 2003. In contrast, incidences of non-compliance occurred at stations along the shoreline primarily associated with rainfall events. The northernmost shore stations (D4–D12) were compliant with COP standards much more frequently than the southernmost stations (D1–D3) located along Imperial Beach. These southern sites are within an area influenced by discharge from the Tijuana River and San Diego Bay, where incidences of non-compliance generally followed periods of the heaviest rainfall. Values exceeding compliance levels along the shore appear to have been caused by contamination from non-outfall sources. Patterns of bacterial concentration and visible satellite imagery data indicate that land-based sources were likely the cause of shoreline and near shore contamination (see Ocean Imaging 2003a, 2003b). In the south, at stations along Imperial Beach, these sources may include San Diego Bay or the Tijuana River, as well as localized terrestrial runoff. To the north, at stations along the Point Loma Peninsula, sources of near shore contamination likely include discharge from north county lagoons, Mission Bay, and the San Diego River, localized terrestrial runoff, or patterns of coastal recreation usage.

Throughout 2003, moderate and high levels of bacteria (>1,000 CFU/100 mL) introduced to offshore waters by the PLOO discharge were restricted to deep waters far from shore. Bacteriological data from offshore samples indicate that discharged materials were prevalent in deep waters immediately surrounding the outfall diffusers. The data also suggest that there may have been lateral transport but that such transport, for the most part, would have been parallel to shore and constrained to deeper waters. Contaminated waters indicative of the waste field were found primarily at stations in the immediate vicinity of the PLOO, but were also evident to the south and less frequently to the north of the outfall terminus. Transport of the waste field northward appeared to be limited to the spring (March and April) and fall (October) periods.

In addition to minimal transport shoreward, bacterial data from 2003 also indicate that wastewater plume did not reach surface waters, even at stations directly above the outfall diffusers. Although physical characteristics of the water column (see Chapter 2) suggest strong seasonal stratification, the lack of an increase in bacterial concentrations in surface waters during winter months indicates that seasonal stratification was not the primary factor limiting plume influences on surface waters. The depth of discharge (94–98m) may in fact be the strongest factor in restricting the wastewater plume to mid- and deep-water depths. Although research shows that vertical displacement of isothermal surfaces within the water column off Point Loma can be as dramatic as 40 m within a 6 hour time period (Hendricks 1994), data from the region do not indicate that such transport ever reached the surface in 2003.

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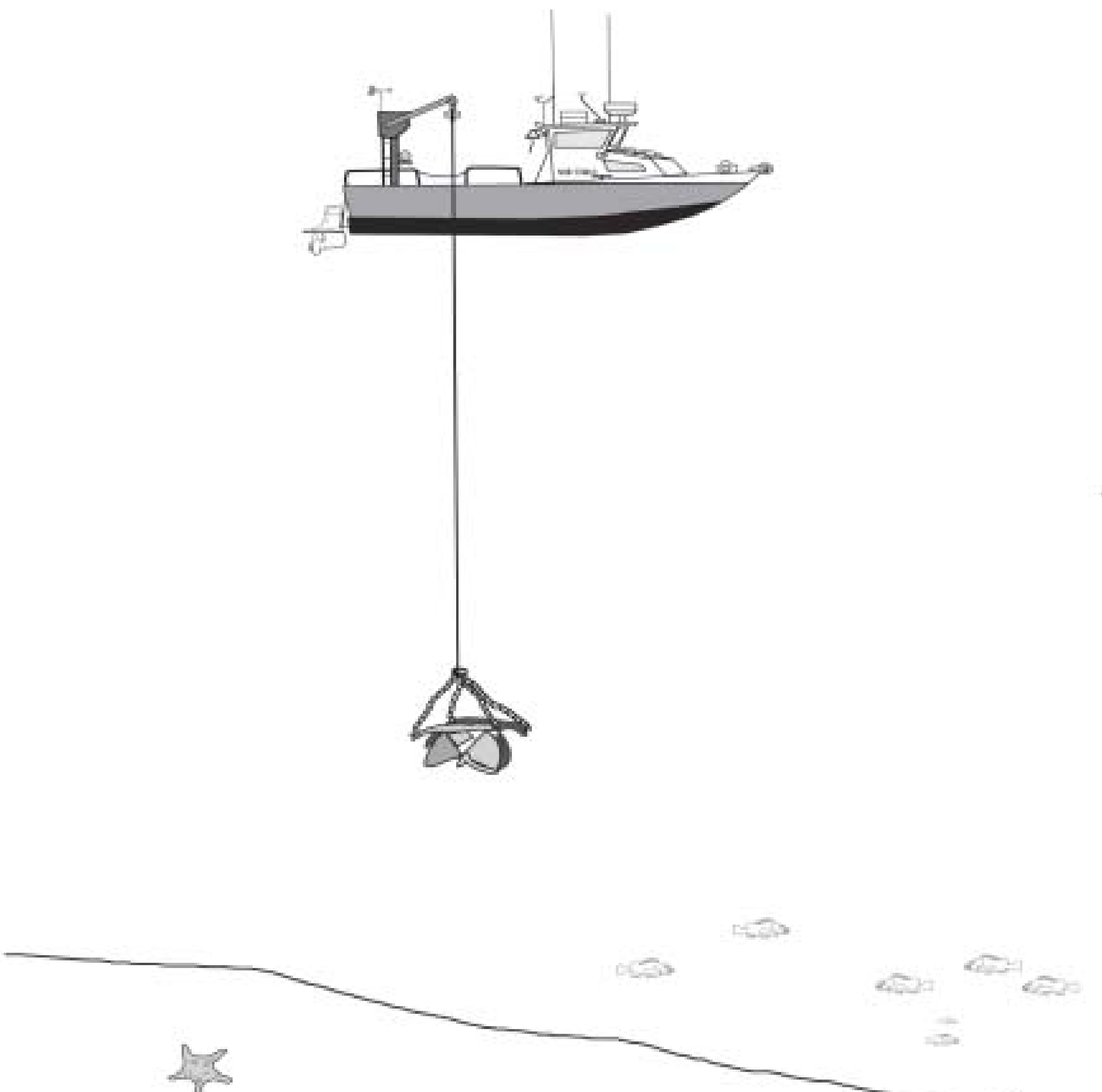
Sediment Characteristics



Chapter 4. Sediment Characteristics

INTRODUCTION

Sediment conditions can influence the distribution of benthic invertebrates by affecting the ability of various species to burrow, build tubes or feed (Gray 1981, Snelgrove and Butman 1994). In addition, many demersal fishes are associated with specific sediment types that reflect the habitats of their preferred prey (Cross and Allen 1993). Both natural and anthropogenic processes affect the distribution, stability and composition of sediments.

Natural factors affecting the distribution and stability of sediments on the continental shelf include bottom currents, exposure to large waves, proximity to river mouths, sandy beaches, submarine basins, canyons and hills, and the presence and abundance of calcareous organisms (Emery 1960). The chemical composition of sediments can be similarly affected by natural factors, such as the geological history of an area. Sediment erosion from bays, cliffs, shores, rivers and streams contribute metals and sedimentary detritus within the area (Emery 1960). Furthermore organic content of sediments is greatly affected by the amount of input from nearshore primary productivity as well as terrestrial plant debris from bays, estuaries and river runoff (Mann 1982, Parsons et al. 1990). Finally, concentrations of organic materials and trace metals within ocean sediments generally increase with increasing amounts of fine sediment particles (Emery 1960, Eganhouse and Vanketesan 1993).

Ocean outfalls are one of many anthropogenic factors that can directly influence the composition and distribution of ocean sediments. Metropolitan wastewater outfalls discharge large volumes of effluent and subsequently deposit a wide variety of organic and inorganic compounds such as pesticides and trace metals (Anderson et al. 1993). Additionally, the physical structure of the outfall pipe can alter the hydrodynamic regime and subsequently substrate composition in the immediate area (see Shepard 1973).

This chapter presents summaries and analyses of sediment grain size and chemistry data collected during 2003 in the vicinity of the City of San Diego's Point Loma Ocean Outfall (PLOO). The major goals of this study are to assess any impact of wastewater discharged through the outfall on benthic sediments in the region. Included are analyses of the spatial and temporal patterns of the various sediment grain size and chemistry parameters in an effort to determine the presence of sedimentary and chemical footprints near the discharge site.

MATERIALS and METHODS

Field Sampling

Sediment samples were collected during January and April 2003 at 23 stations surrounding the PLOO (**Figure 4.1**). These stations span the terminus of the outfall and are located along the 88, 98, and 116-m depth contours. The 17 "E" stations are located within 8 km of the outfall, while the six "B" stations are located greater than 11 km from the discharge site. In July, the sampling was limited to the 12 core stations along the 98-m contour (B12, B9, E26, E25, E23, E20, E17, E14, E11, E8, E5, and E2) in accordance with changes to the PLOO NPDES permit (see Chapter 1, Appendix A).

Benthic sediment samples were collected using a modified 0.1-m^2 chain-rigged van Veen grab (see City of San Diego 2004a). Sub-samples were taken from the top two cm of the sediment surface and handled according to United States Environmental Protection Agency guidelines (USEPA 1987).

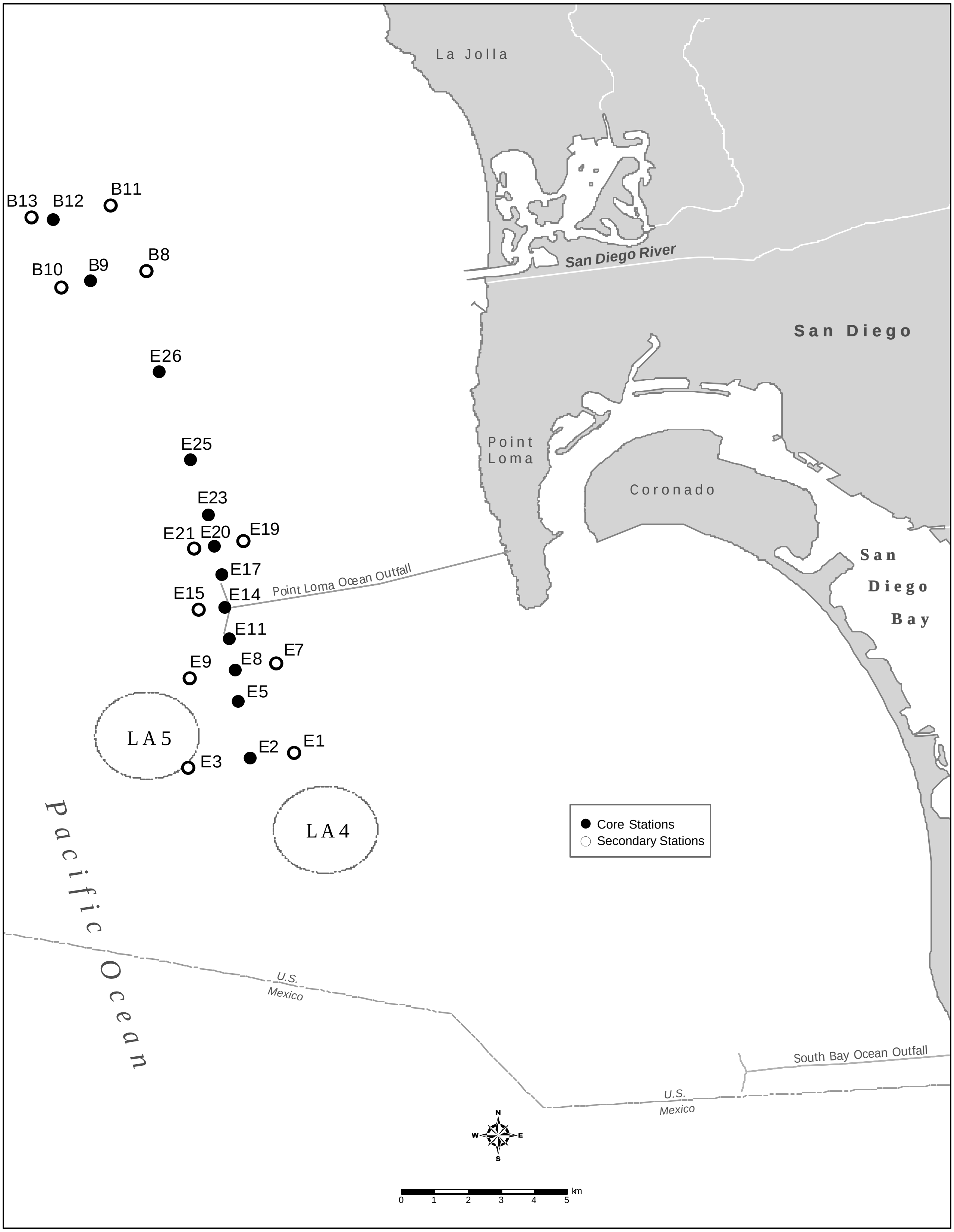


Figure 4.1
Sediment chemistry stations, Point Loma Ocean Outfall Monitoring Program.

Laboratory Analyses

All sediment chemistry and grain size analyses were performed at the City of San Diego's Wastewater Chemistry Laboratory (see City of San Diego 2004b). Particle size analysis was performed using a Horiba LA-920 laser scattering particle analyzer, which measures particles ranging in size from -1 to 11 phi (i.e., 0.00049–2.0 mm; sand, silt and clay fractions). Coarser sediments (e.g., very coarse sand, gravel, shell hash) were removed from samples prior to analysis by screening the samples through a 2.0 mm mesh sieve. These data were expressed as the percent "Coarse" of the total sample sieved (see **Appendix B.2**).

A disparity in trace metal detection levels occurred between the January and April surveys and the July survey as a result of a change in instrumentation. A more sensitive Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) technique for analysis of metals was introduced mid-year of 2003. An IRIS axial ICP-AES system replaced the Atomscan radial ICP-AES. The superior abilities of the IRIS axial ICP-AES lowered the method detection limits (MDL) approximately an order of magnitude. Consequently, low concentrations of metals that would not have been detected in the January and April samples were detected during the July survey. These lower MDL values are presented in this report (see Table 4.3).

Data Analyses

The data output from the Horiba particle size analyzer were categorized as follows: sand was defined as particles ranging in size from >-1 to 4.0 phi, silt as particles from >4.0 to 8.0 phi, and clay as particles >8.0 phi (see **Table 4.1**). These data were standardized and incorporated with a sieved coarse fraction containing particles >2.0 mm in diameter to obtain a distribution of coarse, sand, silt, and clay totaling 100%. The coarse fraction was included with the phi -1 fraction in the calculation of various particle size parameters, which were calculated using a normal probability scale (see Folk 1968). These parameters included mean and median phi size, standard deviation of phi size (sorting coefficient), skewness, kurtosis and percent sediment type (i.e., coarse, sand, silt, clay).

Chemical parameters analyzed were total organic carbon (TOC), total nitrogen, total sulfides, trace metals, chlorinated pesticides, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyl compounds (PCBs). Prior to analysis, these data were generally limited to values above MDLs. In addition, some parameters were determined to be present in a sample with high confidence (i.e., peaks are confirmed by mass-spectrometry), but at levels below the MDL. These were included in the data as estimated values. Any null or "not detected" value was treated as a zero when performing statistical analysis or estimating overall means for the survey area.

Values for metals, TOC, TN and pesticides (i.e., DDE) were compared to median values for the Southern California Bight. These bightwide values were based on the cumulative distribution function (CDF) for each parameter (see Schiff and Gossett 1998) and are presented as the 50% CDF in the tables included herein. Levels of sediment contamination were further evaluated by comparing the results of this study to the Effects Range Low (ERL) sediment quality guideline of Long et al. (1995). The ERL represents chemical concentrations below which adverse biological effects were rarely observed.

RESULTS and DISCUSSION

Particle Size Distribution

During 2003, ocean sediments off Point Loma were composed predominantly of very fine sand and coarse silt with a mean particle size of 4.1 phi (0.061 mm) (**Table 4.2**, **Figure 4.2**). Fine sediments (i.e., silt and clay fractions combined) averaged about 39% of the sediments overall, while sands accounted for 60%. Coarser materials such as shell hash and gravel comprised the remaining 1%. The sorting

Table 4.1

A subset of the Wentworth scale representative of the sediments encountered in the PLOO region. Particle size is presented in phi, microns, and millimeters along with the conversion algorithms. The sorting coefficients (standard deviation in phi units) are based on categories described by Folk (1968).

Wentworth Scale				Sorting Coefficient	
Phi Size	Microns	Millimeters	Description	Standard Deviation	Sorting
-2	4000	4	Pebble	Under 0.35 phi	very well sorted
-1	2000	2	Granule	0.35–0.49 phi	well sorted
0	1000	1	Very coarse sand	0.50–0.70 phi	moderately well sorted
1	500	0.5	Coarse sand	0.71–1.00 phi	moderately sorted
2	250	0.25	Medium sand	1.01–2.00 phi	poorly sorted
3	125	0.125	Fine sand	2.01–4.00 phi	very poorly sorted
4	62.5	0.0625	Very fine sand	Over 4.00 phi	extremely poorly sorted
5	31	0.031	Coarse silt		

Conversions for Diameter in Phi to Millimeters: D (mm) = 2^{-phi}

Conversions for Diameter in Millimeters to Phi: D (phi) = -3.3219 log10 D (mm)

coefficients (standard deviation) were above 1.0 phi at every station, indicating that sediments within the survey area were poorly sorted (i.e., particles of varied sizes) (see Table 4.1). This result reflects the multiple origins of sediments (see Emery 1960), and suggests that these sites are subject to slow moving currents or reduced water motion (Gray 1981).

Most stations had sediments with mean particle sizes between 0.05 and 0.07 mm in diameter (Figure 4.2). As in previous years, sediments were most coarse (>0.07 mm) at two of the northern reference stations (B12 and B13) and stations near the discharge site (E11 and E14), while the smallest average particle sizes (mean diameter $\leq$0.05 mm) were found along the shallow or 88 m contour at stations B8, B11 and E19. The coarse sediments at the northern sites may be related to their location along the outer shelf where strong currents and internal waves export fine sediments down the slope leaving shell hash and larger particles behind (see Shepard and Marshall 1978, Boczar-Karakiewicz et al. 1991). In contrast, coarser sediments at station E14 are probably due to its location near the center of the outfall "wye." Visual examination of the sediments at this site have occasionally revealed the presence of coarse, black sand that was used as stabilizing material around the outfall pipe (see Appendix B.2). This type of black sand was also regularly present at stations E8, E9, E11 and E15 indicating the potential spread of this ballast material south and east of the outfall. Furthermore, sediments at E3 and E5 also contained varying amounts of coarse materials that are likely related to their proximity to the nearby LA-5 disposal site. Evidence that the main disposal mound has dispersed into areas outside the boundaries of LA-5 have been previously detected by the United States Geological Survey (Gardner et al. 1998; **Figure 4.3**).

Organic Indicators

Generally, the distribution of organic indicators concentrations in 2003 was similar to patterns seen prior to discharge (see City of San Diego 1995). The highest concentrations of biochemical oxygen demand (BOD), total nitrogen (TN), total organic carbon (TOC), and total volatile solids (TVS) were generally found north of the PLOO, particularly at stations B8, B11, B12, and B13 (Table 4.2). Most TN values were slightly above the median CDF level, and along with TOC, generally tended to increase with decreasing particle size. The highest sulfide concentrations were found at station E14 (14.9 ppm), along with relatively high levels of BOD (376 mg/L).

Table 4.2

Summary of particle size parameters and organic loading indicators at PLOO stations during 2003. Data are expressed as annual means. N = 3 for the core stations indicated in bold type; N = 2 for all others. CDF = cumulative distribution functions (see text); NA=not analyzed. MDL = method detection limit. Area Mean = area mean for 2003. Values that exceed the median CDF are indicated in bold type.

		Particle Size						Organic Indicators				
		Mean	Mean	SD	Coarse	Sand	Fines	BOD	Sulfides	TN	TOC	TVS
Station	Depth	phi	mm	phi	%	%	%	mg/L	ppm	WT%	WT%	WT%
North Reference Stations												
B11	88	4.6	0.041	2.0	2.0	41.5	56.4	379	1.7	**0.100**	**0.928**	4.61
B8	88	4.5	0.042	1.5	0.0	44.3	55.4	317	2.5	**0.084**	**0.784**	3.05
B12	98	3.5	0.091	2.1	1.8	67.8	30.3	403	3.3	**0.113**	**0.950**	3.58
B9	98	4.2	0.055	1.6	0.0	58.9	41.1	295	2.0	**0.062**	0.545	3.08
B13	116	3.5	0.090	2.2	1.6	65.7	32.5	423	2.6	**0.117**	**1.955**	3.89
B10	116	4.0	0.062	1.7	0.0	67.3	32.6	364	5.3	**0.055**	0.502	2.89
Stations North of the Outfall												
E19	88	4.3	0.049	1.4	0.0	52.6	47.3	280	2.4	**0.062**	0.548	2.40
E20	98	4.0	0.061	1.4	0.0	62.6	37.4	286	2.0	**0.056**	0.514	1.85
E23	98	4.1	0.057	1.5	0.0	60.1	39.9	286	2.8	**0.060**	0.556	2.07
E25	98	4.1	0.058	1.5	0.0	60.6	39.4	319	6.2	**0.063**	0.576	2.10
E26	98	4.3	0.051	1.6	0.0	56.0	43.4	281	4.3	**0.065**	0.587	2.17
E21	116	4.1	0.058	1.5	0.0	64.6	35.3	322	2.3	**0.061**	0.559	2.36
Outfall Stations												
E11	98	3.8	0.072	1.4	0.0	68.9	31.1	277	3.8	0.044	0.390	1.73
E14	98	3.8	0.072	1.7	4.4	65.2	30.4	376	14.9	0.046	0.438	1.57
E17	98	3.9	0.067	1.4	0.1	67.3	32.4	314	5.4	0.048	0.438	1.67
E15	116	4.0	0.062	1.5	0.3	66.2	33.4	278	2.7	**0.056**	0.513	2.31
Stations South of the Outfall												
E1	88	4.1	0.058	2.0	1.3	55.4	41.8	254	1.4	**0.055**	0.543	2.38
E7	88	4.3	0.051	1.5	0.0	55.4	44.4	258	2.1	**0.060**	0.589	2.42
E2	98	4.2	0.055	1.9	1.6	53.7	44.0	248	5.0	0.047	0.483	2.48
E5	98	3.9	0.066	1.5	0.0	65.6	34.5	219	1.6	0.048	0.459	1.88
E8	98	3.8	0.070	1.4	0.1	68.4	31.5	247	3.7	0.044	0.411	1.79
E3	116	3.9	0.065	2.3	4.7	53.4	41.8	197	0.8	0.032	0.335	2.25
E9	116	4.3	0.051	1.8	1.8	55.6	42.6	233	1.8	**0.061**	0.586	2.56
Area Mean		4.1	0.061	1.7	0.9	59.9	39.1	298	3.5	**0.063**	**0.617**	2.48
MDL								2	0.14	0.005	0.01	0.11
50% CDF								NA	NA	0.050	0.597	NA

Trace Metals

Sixteen different trace metals were detected in the sediments off Point Loma in 2003 (**Table 4.3**). Two metals, silver and thallium, were not detected at any station. Overall sediment concentrations were generally low, and most metals occurred at levels less than the median values for the Southern California Bight (i.e., 50% CDF). Despite these generally low values however, several stations had sediments concentrations of three or more metals higher than the median CDF. These included several northern stations (i.e., B8, B11, B12, B13) as well as a group of stations located near the southern disposal site LA-5 (i.e., E1, E2, E3, E7, E8, E9). The reason for the elevated metal concentrations at the four northern sites is unclear. In contrast, such values near LA-5 have been documented previously (see City of San Diego 2003a, b). For

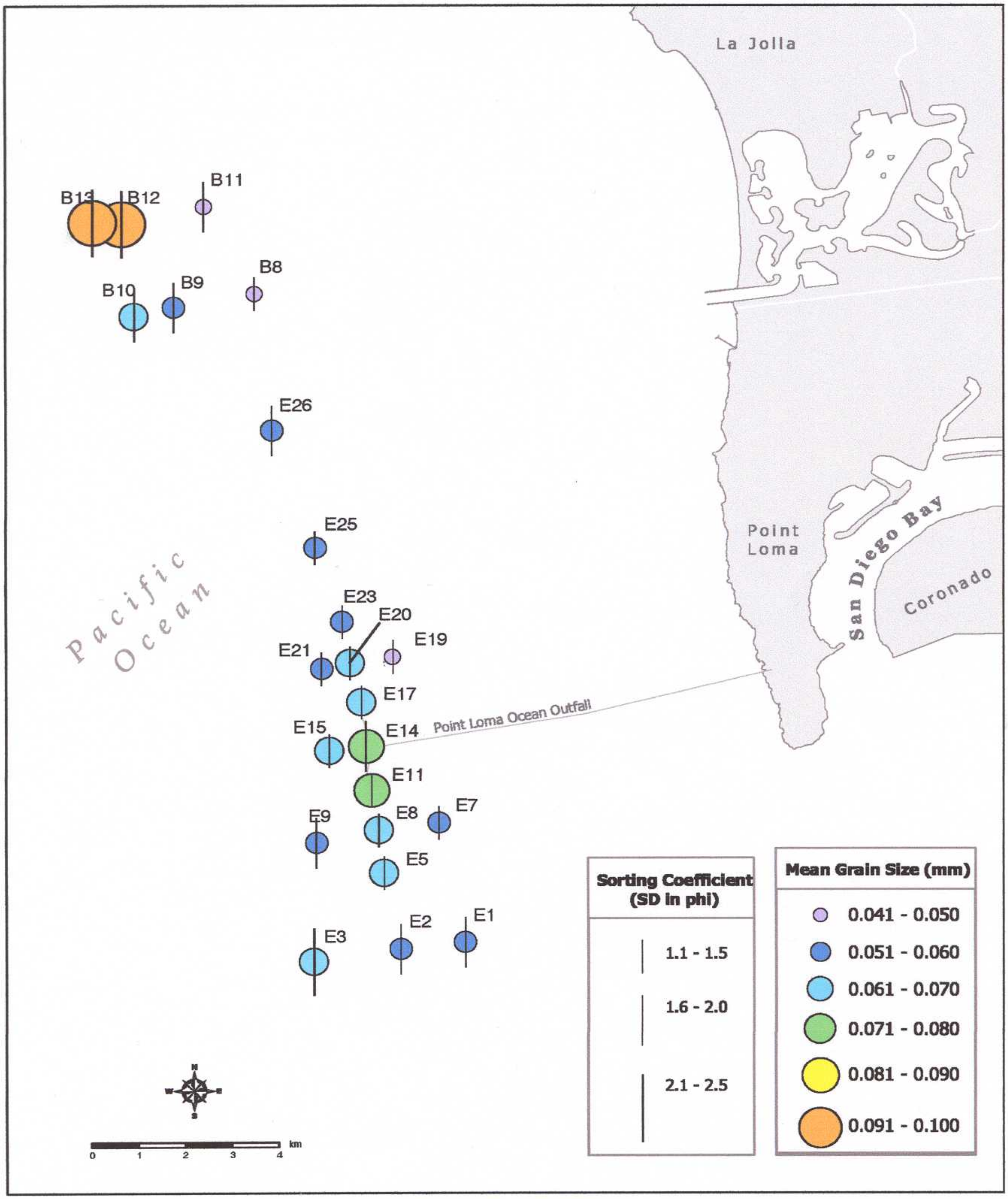


Figure 4.2

Particle size distribution for sediment chemistry stations during 2003. N = 3 for the core stations (see Field Sampling); N = 2 for all others. Mean particle size is based on diameter in millimeters, and sorting coefficient (standard deviation) is in phi units.

Table 4.3

Concentrations of trace metals (parts per million) detected at each station during 2003. N = 3 for the core stations indicated in bold type; N = 2 for all others. CDF = cumulative distribution function (see text). MDL = method detection limit. ERL TV = Effects Range Low Threshold Value. NA = not available. Area Mean = area mean for 2003. Values that exceed the median CDF are indicated in bold type. The names of each trace metal represented by the periodic table symbol is presented in Appendix B.1.

Station	Depth	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Sn	Zn
North Reference Stations																	
B11	88	**13150**	nd	3.6		nd	**1.39**	24.8	8.0	**18500**	4.3	127.0	**0.040**	5.3	**0.37**	nd	38.4
B8	88	**15900**	**3.1**	3.9		nd	nd	23.7	10.0	**17000**	3.4	143.5	**0.043**	4.7	nd	nd	36.6
B12	98	8267	**1.9**	4.7	19.5	0.11	**0.96**	25.0	7.0	**21400**	3.7	76.2	0.022	4.1	nd	0.3	37.5
B9	98	**10340**	nd	3.5	67.4	0.09	0.02	21.8	7.1	**17367**	3.4	107.3	0.032	5.2	nd	0.3	33.5
B13	116	7700	**2.8**	**15.1**		nd	nd	**34.8**	4.0	**26050**	2.7	77.0	0.022	3.5	0.12	nd	36.6
B10	116	8600	nd	3.3		nd	nd	20.1	4.4	14600	nd	80.5	0.021	3.4	nd	nd	29.0
Stations North of the Outfall																	
E19	88	**14100**	**3.5**	3.4		nd	nd	20.5	7.5	14400	nd	131.0	0.036	4.9	nd	nd	32.3
E20	98	**9517**	nd	2.9	35.1	0.06	0.02	16.4	8.3	11400	1.4	96.5	0.027	5.0	nd	0.2	25.3
E23	98	**10427**	nd	3.2	36.4	0.06	0.03	**17.1**	9.2	12633	1.8	102.3	0.033	5.2	nd	0.3	27.5
E25	98	**10140**	nd	3.2	34.5	0.06	0.03	17.0	8.8	12233	1.6	97.9	**0.096**	5.0	nd	0.3	32.4
E26	98	**10877**	**1.9**	3.4	34.3	0.06	0.03	17.6	9.1	12767	3.6	105.7	0.034	5.8	nd	0.3	28.3
E21	116	**9545**	nd	2.9		nd	nd	16.0	6.9	10850	nd	86.8	0.025	3.8	nd	nd	23.9
Outfall Stations																	
E11	98	7770	nd	2.7	22.7	0.04	0.02	14.3	5.6	9797	1.0	78.4	**0.048**	4.4	nd	0.2	21.5
E14	98	8163	nd	3.3	26.3	0.05	0.03	15.2	7.8	10957	0.6	90.1	0.022	4.9	nd	0.2	24.0
E17	98	8803	nd	2.8	28.2	0.05	0.03	15.0	9.1	10663	8.0	91.5	0.021	4.4	nd	0.2	27.9
E15	116	**9585**	nd	3.2		nd	nd	16.6	5.9	11000	nd	86.9	0.026	3.6	0.14	nd	24.4
Stations South of the Outfall																	
E1	88	**11100**	nd	3.6		**0.70**	nd	14.7	9.7	13100	nd	99.6	**0.065**	8.5	0.12	nd	30.6
E7	88	**11700**	**2.6**	2.6		nd	nd	18.6	4.9	12950	nd	108.5	**0.052**	4.3	nd	nd	30.0
E2	98	**12267**	nd	3.1	67.6	0.08	0.23	18.5	**14.8**	16100	2.4	116.3	**0.056**	7.0	0.14	0.3	35.2
E5	98	9120	nd	2.7	29.8	0.05	0.02	15.2	7.5	11100	1.0	88.2	0.037	4.4	nd	0.2	23.9
E8	98	8277	nd	2.8	26.6	0.06	0.02	15.0	6.9	10343	1.1	82.9	0.024	4.5	nd	0.3	22.5
E3	116	**13250**	nd	3.3		nd	nd	17.3	**14.2**	15000	nd	121.0	**0.054**	3.3	nd	nd	33.6
E9	116	9175	nd	**6.3**		nd	nd	21.8	**43.7**	14700	4.1	90.2	0.019	3.6	**0.30**	nd	**69.3**
MDL		1.15	0.13	0.33	0.002	0.001	0.01	0.016	0.028	0.75	0.142	0.004	0.003	0.036	0.24	0.059	0.052
50% CDF		9400	0.19	4.8	NA	0.26	0.29	34.0	12.0	16800	10.2	NA	0.040	16.3	0.29	NA	56
ERL TV		NA	2.0	8.2	NA	NA	1.2	81.0	34.0	NA	46.7	NA	0.150	20.9	NA	NA	150

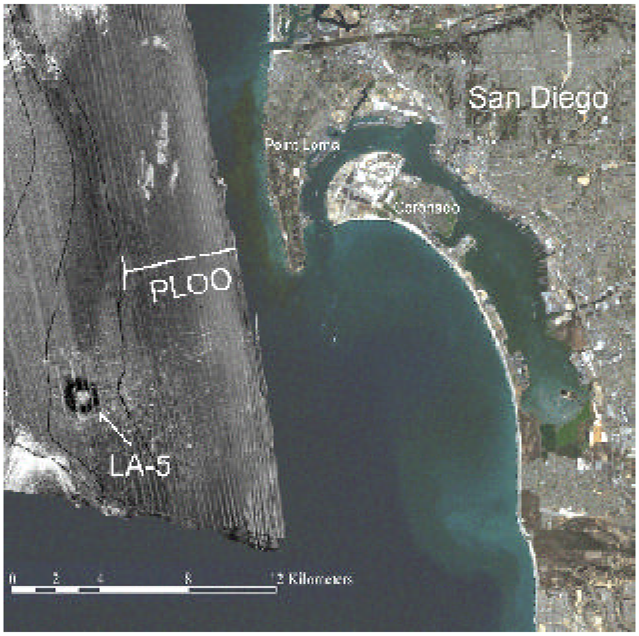


Figure 4.3

The LA-5 dredge disposal site shown as an acoustic backscatter image superimposed on a Landsat-7 satellite land image of San Diego (USGS 1998). Lighter areas represent harder (more dense) substrates.

example, the high copper values at stations E9, E2 and E3 are likely related to the deposition of copper-laden sediments dredged from San Diego Bay (see City of San Diego 2003c). Almost all metal concentrations were below ERL levels. The exceptions included copper (station E9), arsenic (station B13), and cadmium (station B11).

Generally, there was no discernable pattern in trace metal contamination related to proximity to the PLOO. For example, metal concentrations were low at the outfall stations E11, E14, and E17. Overall, metal concentrations increased with greater proportions of fine sediments found at a station. Seven of the 10 stations with concentrations of three or more metals above the median CDF levels averaged over 40% fine sediments.

Pesticides, PCBs, and PAHs

DDT was detected as its final metabolic degradation product (p,p-DDE) at five stations in April and was the only pesticide found in sediments off Point Loma during 2003. All detected values were at or below the MDL for DDE (3,800 ppt) and well below the median CDF value for total DDT (10,000 ppt). However, several stations (E8, E23, and E25) exceeded the median CDF level for DDE (1,200 ppt) which is below the MDL. The concentrations of DDE at these stations were 3,800, 1,500, and 1,250 ppt, respectively. Station E8 also exceeded the ERL value of 1,580 ppt. Concentrations of DDE below the median CDF were detected at stations B8 and E19 (540 and 1,100 ppt, respectively).

Table 4.4

Concentrations for PCB (ppt, parts per trillion) compounds in PLOO sediments during 2003. MDL = method detection limit. CDF = cumulative distribution function (see text). Undetected values are indicated by “nd@. N = 3 for station B9; N = 2 for E1 and E9.

SITE	PCB 101	PCB 110	PCB 118	PCB 149	TOTAL PCB
B9	867	nd	nd	nd	867
E1	290	nd	nd	nd	290
E9	1350	1250	900	600	4100
MDL	2600	2900	2700	2500	
50% CDF					2,600

Polychlorinated biphenyl compounds (PCBs) were mostly undetected during 2003. Four congeners were found at levels below their MDLs among three stations (see **Table 4.4**). All four compounds were found at stations E9, while PCB 101 was the only congener present at stations E1 and B9.

Thirteen PAH compounds were detected in low concentrations during 2003 (**Appendix B.3**). All total PAH concentrations from the sampling area were well below the ERL of 4,022 ppb. The highest concentration of total PAHs were found primarily at the stations E2 (176 ppb) and E3 (168 ppb), near the LA-5 dredge materials disposal site. These two stations also had the greatest mix of PAH compounds, 11 and 8 different compounds, respectively. Some PAHs were also present at sites near the outfall at stations E11, E14, and E17, but at concentrations below 62 ppb. Concentrations of PAH contaminants in the area surrounding the LA-5 dredge disposal site have been well-documented (e.g., Anderson et al. 1993, City of San Diego 2000, 2001, 2002, 2003a–c); however, the detection PAHs near the outfall, even at these low levels, is rare.

SUMMARY and CONCLUSIONS

During 2003 the overall sediments surrounding the PLOO consisted primarily of very fine sand and coarse silt. Three of the shallowest stations had the greatest proportions of fine sediments, while the greatest amount of coarse materials (e.g., coarse sand, gravel, shell hash) were found at the two deepest and northernmost reference stations and two stations near the outfall site. Several stations located between the outfall and LA-5 also contained variable amounts of ballast sand, coarse particles, and shell hash. Generally, these results reflect the multiple anthropogenic (e.g., outfall construction, dredge disposal) and natural influences (e.g., Pleistocene and recent detrital deposits) on the region's sediment composition.
Overall, the concentration and distribution of organic indicators in 2003 was very similar to previous surveys. The highest concentrations of BOD, total nitrogen, total carbon, and total volatile solids occurred at the northern reference sites, while the highest values for sulfides occurred near the PLOO (i.e., station E14). Stations located near the LA-5 disposal site generally had relatively low values of organic indicators.

Trace metals occurred in the highest concentrations at northern reference sites characterized by coarse sediments, and at some stations near the LA-5 disposal site. The highest copper concentrations were found at stations near LA-5, and may be associated with the disposal of dredged sediments from San Diego Bay (see City of San Diego 2003c). Such sediments often contain residues of copper-tainted antifouling paint, 70% of which may originate at Navy berths in the bay (Schiff and Cross 1992; Steinberger et al. 2003). There was an indication of increasing trace metal concentrations with decreasing particle size. This is expected since the accumulation of fine particles generally influences the content of organic materials and metals in sediments (Eganhouse and Venkatesan 1993). Most metals occurred in concentrations well below the median values for sediments in the Southern California Bight, and below ERL levels.

During 2003, only DDE (the final metabolic degradation product of DDT) was detected. This compound was found at only five stations during the April survey. Concentrations of DDE at three stations were above median CDF levels and one was above the ERL sediment quality guideline, but all were generally near or below method detection limits. However, the widespread distribution of this compound within the survey area is indicative of the ubiquitous presence and the inherent stability of DDT derivatives.

Values for PAHs and PCBs were generally near or below detection limits at all sampling sites. When detected, however, both PAHs and PCBs were more commonly found at stations located near the LA-5 dredge materials disposal site (i.e., stations E1, E2, E3, E5, E9). Historically, concentrations of PAHs and PCBs have been higher at these southern stations than elsewhere off San Diego, and are most likely the result of misplaced deposits of dredged material that were originally destined for LA-5. Between 1991 and 1997, ten large dredging projects, including the large U.S.Navy Channel Deepening project conducted in 1997, disposed contaminated sediment from San Diego Bay at LA 5 (Steinberger et al. 2003). Previous studies of PAHs, PCBs, as well as metals and DDT in this area have been attributed to the deposits from LA-5 (see Anderson et al. 1993; City of San Diego 2003c; Steinberger et al. 2003). PAHs were also found in very low concentrations at three outfall stations (E11, E14, and E17). Such occurrences are rare near the outfall, and the source of the contamination is unclear, particularly since PAHs were undetected in effluents from large municipal wastewater treatment facilities in Southern California (Steinberger and Schiff 2003).

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Macrobenthic Communities

Chapter 5. Macrobenthic Communities

INTRODUCTION

Benthic macrofauna living in marine soft sediments can be sensitive indicators of environmental disturbance (Pearson and Rosenberg 1978). Because benthic macrofauna have limited mobility, many are unable to avoid adverse conditions such as those brought about by natural stressors (e.g. El Niño/La Niña events) or human impacts (e.g. toxic contamination and organic enrichment from anthropogenic sources). Consequently, the assessment of benthic communities has been used to monitor the effects of municipal wastewater discharge on the ocean environment (see Zmarzly et al. 1994, Diener et al. 1995, Bergen et al. 2000).

Sediments on the southern California coastal shelf typically contain a diverse community of macrofaunal invertebrates (Fauchald and Jones 1979, Thompson et al. 1992, Bergen et al. 2001). These animals are essential members of the marine ecosystem, serving vital functions in wide ranging capacities. For example, many species of benthic invertebrates provide the prey base for fish and other organisms, while others decompose organic material as a crucial step in nutrient cycling. The structure of macrofaunal communities is influenced by many factors including sediment conditions (e.g., particle size and sediment chemistry), water conditions (e.g., temperature, salinity, dissolved oxygen, and current velocity) and biological factors (e.g., food availability, competition, and predation). Although human activities can affect these factors, natural processes largely control the structure of invertebrate communities in marine sediments. Therefore, in order to determine whether changes in community structure are related to human impacts or natural processes, it is necessary to have documentation of background or reference conditions for an area. Such information is available for the region surrounding the Point Loma Ocean Outfall (PLOO) and the San Diego region in general (e.g., City of San Diego 1995, 1999).

This chapter presents analyses and interpretation of the macrofaunal data collected during 2003 at fixed stations surrounding the PLOO discharge site off San Diego, California. Included are descriptions and comparisons of the different assemblages that inhabit soft bottom sediments in the area and analysis of benthic community structure.

MATERIALS and METHODS

Collection and Processing of Samples

Benthic samples were collected at 21 stations that span 8 km south and 11 km north of the outfall terminus (**Figure 5.1**). A total of 107 benthic grabs were taken during three surveys in 2003. All 21 stations were sampled during the January and April surveys, while changes to the NPDES permit (see Chapter 1, Appendix A) limited the July sampling to 12 core station along the 98–m contour (B12, B9, E26, E25, E23, E20, E17, E14, E11, E8, E5, and E2). Detailed methods for locating the stations and conducting benthic grabs are described in the City of San Diego Quality Assurance Manual (City of San Diego 2004).

Samples for benthic community analysis were collected from two replicate 0.1 m^2 van Veen grabs per station during each survey. The criteria established by the United States Environmental Protection Agency to ensure the consistency of grab samples were followed with regard to sample disturbance and depth of penetration (USEPA 1987). All samples were sieved aboard ship through a 1.0 mm mesh screen. Organisms retained on the screen were relaxed for 30 minutes in a magnesium sulfate solution and then fixed in buffered formalin (see City of San Diego 2004). After a minimum of 72 hours, each sample was rinsed with fresh water and transferred to 70% ethanol. All organisms were sorted from the debris into major

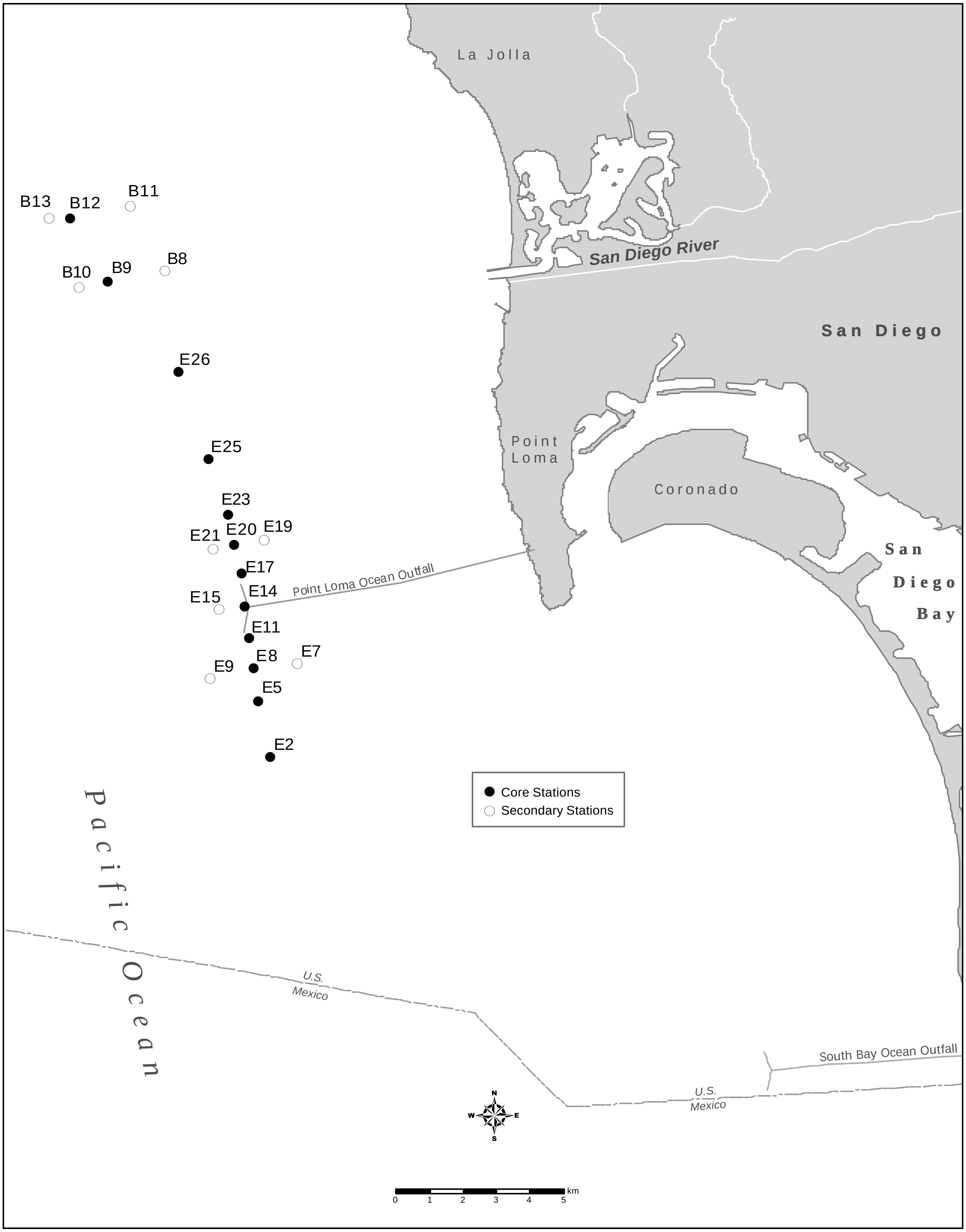

Figure 5.1
Macrobenthic station locations, Point Loma Ocean Outfall Monitoring Program.

taxonomic groups by a subcontractor then identified to species or the lowest taxon possible and enumerated by City of San Diego marine biologists. Macrofaunal biomass for January and April surveys was measured as the wet weight in grams for each of the following major groups: Annelida (mostly polychaetes), Arthropoda (mostly crustaceans), Mollusca, Ophiuroidea, non–ophiuroid Echinodermata, and all other phyla combined (e.g., Cnidaria, Platyhelminthes, Phoronida, Sipuncula, etc.). Values for ophiuroids (i.e., brittle stars) and all other echinoderms were combined to give a total echinoderm biomass. Per changes to the NPDES permit, biomass data for the July survey was not measured. One sample (Station B9, replicate 2) collected in January 2003, was excluded from analyses due to preservation problems that made it difficult or impossible to identify the animals. Additional information about this sample is available from the city's Marine Biology Laboratory.

Statistical Analyses

Multivariate analyses were performed using PRIMER v5 (Plymouth Routines in Multivariate Ecological Research) software to examine spatio–temporal patterns in the overall similarity of benthic assemblages in the region (see Clarke 1993, Warwick 1993). These analyses included classification (cluster analysis) by hierarchical agglomerative clustering with group–average linking and ordination by non–metric multidimensional scaling (MDS). Prior to analysis, macrofaunal abundance data were square–root transformed and the Bray–Curtis measure of similarity was used as the basis for comparison in both classification and ordination. Analyses were run on grabs as statistical replicates used to identify distinct cluster groups among 107 samples at 21 stations.

Annual means for the following community parameters were calculated for each station and each cluster group: species richness (number of species per grab); total number of species (i.e., cumulative of two replicate samples); abundance (number of individuals per grab); biomass (grams per grab, wet weight); Shannon diversity index (H' per grab); Pielou's evenness index (J' per grab); Swartz dominance index (minimum number of species accounting for 75% of the abundance in each grab; see Swartz 1978); Infaunal Trophic Index (ITI per grab; see Word 1980) and Benthic Response Index (BRI per grab; see Smith et al 2001).

RESULTS and DISCUSSION

Community Parameters: Site Comparisons and Region–wide Summaries

Number of Species

In total, 548 macrofaunal taxa were identified during the 2003 PLOO surveys. Mean values of species richness ranged from 73 to 113 species per 0.1 m^2 (**Table 5.1**). As in previous years, the number of species was highest at stations generally characterized by coarser sediments (e.g., B13 and E14).

Polychaetes were the most diverse taxa in the region, accounting for about 53% of all species collected during 2003. Crustaceans accounted for 24% of the species, molluscs 12%, echinoderms 7%, and all remaining taxa combined accounted for about 4% of the species.

Macrofaunal Abundance

Mean macrofaunal abundance among sites averaged 228 to 753 animals per 0.1 m^2 in 2003 (Table 5.1). The largest number of animals occurred at stations E26 (753 animals), E14 (608 animals), E25 (522 animals), and B8 (474 animals). The remaining sites ranged from 228 to 366 animals per 0.1 m^2.

Polychaetes were the most numerous organisms collected, accounting for 60% of the mean abundance. Crustaceans accounted for 16% of mean abundance, echinoderms 13%, molluscs 9%, and all other phyla combined about 1%. Station E14 nearest the outfall had the second highest relative abundance of polychaetes among all stations (75%) and the lowest relative abundance of echinoderms (2%). These values generally were similar to those reported for 2002 (see City of San Diego 2003). The two most abundant species collected in 2003 were the polychaete worm, *Myriochele* sp M

(7,475 individuals) and the ophiuroid, *Amphiodia urtica* (3,126 individuals).

Species Diversity and Dominance

Species diversity (H') among sites during 2003 was similar to that observed prior to wastewater discharge (see City of San Diego 1995). Mean diversity values ranged from 2.4 to 4.2 during the year (Table 5.1). The highest diversity (H' $\geq$4.0) occurred at stations along the 116 m contour (i.e. B10, B13, E21, E9) and station E2, nearest the LA5 disposal dumpsite. Diversity was lowest at station E26.

Species dominance was expressed as the Swartz 75% dominance index, the minimum number of species comprising 75% of a community by abundance. Consequently, lower index values (i.e., fewer species) indicate higher dominance. Benthic assemblages in 2003 were characterized by relatively high numbers of evenly distributed species. Dominance averaged 28 species per station, similar to the 29 species per station present in 2002 (see City of San Diego 2003). Dominance was lowest at stations B8 and E26, both averaging nine species. Evenness (J') values have also remained stable over

Table 5.1

Benthic macrofaunal community parameters for PLOO stations during 2003. Data are expressed as annual means for: species richness (no. species/0.1 m^2, SR); total no. species per site (Tot Spp); abundance/0.1 m^2 (Abun); biomass, g/0.1 m^2; diversity (H'); evenness (J'); Swartz dominance, (no. species comprising 75% of a community by abundance, Dom); benthic response index (BRI); and infaunal trophic index (ITI). N values indicate number of grabs in 2003 as statistical replicates. N values for biomass data (sampled only January and April) are given in parentheses.

	N	SR	Tot Spp	Abun	Biomass	H'	J'	Dom	BRI	ITI
88-m										
B11	4	96	135	308	4.3	3.9	1.0	35	6	78
B8	4	73	107	474	8.1	2.7	0.8	9	-1	83
E19	4	75	105	283	4.5	3.5	1.0	24	4	86
E7	4	79	115	258	3.8	3.6	1.0	28	3	89
98-m Core										
B12	6 (4)	102	142	366	3.7	3.8	1.0	34	6	77
B9	5 (3)	78	100	360	4.5	3.2	0.9	20	1	81
E26	6 (4)	90	123	753	5.3	2.4	0.6	9	4	74
E25	6 (4)	95	127	522	6.8	3.2	0.8	21	5	78
E23	6 (4)	78	106	249	4.0	3.8	1.0	28	4	85
E20	6 (4)	82	115	257	5.2	3.8	1.0	30	7	83
E17	6 (4)	87	125	287	6.6	3.9	1.0	32	9	79
E14	6 (4)	108	149	608	2.7	3.4	0.8	23	14	70
E11	6 (4)	83	115	269	6.0	3.9	1.0	31	6	83
E8	6 (4)	74	104	272	3.7	3.6	1.0	25	3	86
E5	6 (4)	73	101	307	8.1	3.4	0.9	22	1	83
E2	6 (4)	102	144	320	4.1	4.0	1.0	37	2	84
116-m										
B13	4	113	160	365	4.1	4.0	1.0	41	5	78
B10	4	92	126	249	2.7	4.1	1.1	38	9	76
E21	4	85	122	228	3.5	4.0	1.0	36	5	85
E15	4	86	125	282	3.0	3.7	1.0	30	5	80
E9	4	107	149	300	5.2	4.2	1.0	43	3	82
All Stations										
Mean		88	123	348	4.8	3.6	0.9	28	5	81
Min		73	100	228	2.7	2.4	0.6	9	-1	70
Max		113	160	753	8.1	4.2	1.1	43	14	89

time, with mean values ranging from 0.6 to 1.1 among all stations (Table 5.1).

Environmental Disturbance Indices

Mean benthic response index (BRI) values ranged from –1 to 14 at the various stations in 2003. These values suggest that benthic communities in the region are relatively undisturbed, as BRI values below 25 (on a scale of 100) are indicative of reference conditions (see Smith et al. 2001). Mean annual ITI values ranged from 70 to 89 per station in 2003 (Table 5.1). These values were similar to those reported in previous years (see City of San Diego 2003), with the lowest value again occurring at station E14 located nearest the discharge site. Nevertheless, mean values were >60 at all stations, indicating undisturbed sediments or "normal" environmental conditions (see Bascom et al. 1979).

Dominant Species

The dominant animals that occurred off Point Loma during 2003 are listed in **Table 5.2**. Various polychaetes

Table 5.2

Dominant macroinvertebrates at PLOO benthic stations sampled during 2003. Included are the 10 most abundant taxa overall and per occurrence, and the 10 most frequently collected taxa. Data are expressed as: mean abundance per sample (MAS), mean abundance per occurrence (MAO), and frequency of occurrence (FO).

Species	Higher taxa	MAS	MAO	FO
Most Abundant				
Myriochele sp M	Polychaeta: Oweniidae	69.2	84.9	81
Amphiodia urtica	Echinodermata: Ophiuroidea	29.8	29.8	100
Proclea sp A	Polychaeta: Terebellidae	18.4	18.8	98
Myriochele gracilis	Polychaeta: Oweniidae	14.8	14.8	100
Chaetozone hartmanae	Polychaeta: Cirratulidae	9.5	9.5	100
Euphilomedes carcharodonta	Crustacea: Ostracoda	7.9	9.1	87
Amphiodia sp	Echinodermata: Ophiuroidea	6.4	6.4	100
Euphilomedes producta	Crustacea: Ostracoda	5.9	6.7	89
Paradiopatra parva	Polychaeta: Onuphidae	4.9	4.9	100
Sternaspis fossor	Polychaeta: Sternaspidae	4.8	4.9	98
Most Abundant per Occurence				
Myriochele sp M	Polychaeta: Oweniidae	69.2	84.9	81
Amphiodia urtica	Echinodermata: Ophiuroidea	29.8	29.8	100
Caecum crebricinctum	Mollusca: Gastropoda	3.6	27.8	13
Proclea sp A	Polychaeta: Terebellidae	18.4	18.8	98
Myriochele gracilis	Polychaeta: Oweniidae	14.8	14.8	100
Chloeia pinnata	Polychaeta: Amphinomidae	4.1	14.0	30
Chaetozone hartmanae	Polychaeta: Cirratulidae	9.5	9.5	100
Euphilomedes carcharodonta	Crustacea: Ostracoda	7.9	9.1	87
Urothoe varvarini	Crustacea: Amphipoda	1.6	8.0	20
Euphilomedes producta	Crustacea: Ostracoda	5.9	6.7	89
Most Frequently Collected				
Amphiodia urtica	Echinodermata: Ophiuroidea	29.8	29.8	100
Myriochele gracilis	Polychaeta: Oweniidae	14.8	14.8	100
Chaetozone hartmanae	Polychaeta: Cirratulidae	9.5	9.5	100
Amphiodia sp	Echinodermata: Ophiuroidea	6.4	6.4	100
Paradiopatra parva	Polychaeta: Onuphidae	4.9	4.9	100
Prionospio (Prionospio) dubia	Polychaeta: Spionidae	3.3	3.3	100
Clymenura gracilis	Polychaeta: Maldanidae	3.1	3.1	100
Diastylis crenellata	Crustacea: Cumacea	2.7	2.7	100
Proclea sp A	Polychaeta: Terebellidae	18.4	18.8	98
Sternaspis fossor	Polychaeta: Sternaspidae	4.8	4.9	98

were dominant species throughout the region. The two most abundant polychaetes were the oweniid *Myriochele* sp M (about 69/0.1 m^2) and the terebellid *Proclea* sp A (~18/0.1 m^2). Seven other polychaetes were among the dominant species in terms of overall abundance, abundance per occurrence, or frequency of occurrence during the year. The ophiuroid *Amphiodia urtica* was the second most abundant species, averaging about 30 animals per 0.1 m^2. In addition, since juveniles cannot be identified to species and usually are recorded at the generic or familial level (i.e., *Amphiodia* sp or Amphiuridae, respectively), this number underestimates actual populations of *A. urtica*. The only other species of *Amphiodia* that occurred in 2003 was *A. digitata*, which accounted for about 6% of ophiuroids in the genus *Amphiodia* that could be identified to species (i.e., *A. urtica* = about 94%). Other amphiurid brittle stars accounted for less than 5% of the total. If the values for these taxa are adjusted accordingly, then the estimated population size for *A. urtica* off Point Loma becomes about 39 animals per 0.1 m^2. Other dominant species included the ostracods *Euphilomedes carcharodonta* and *E. producta.* As in previous years, the gastropod *Caecum crebricinctum* occurred in relatively high densities at two of the northern sites (stations B12 and B13).

Many of these abundant species were dominant prior to discharge in 1993 and have remained dominant since the initiation of outfall operation (e.g., City of San Diego 1995, 1999, 2003). For example, *A. urtica* has been among the most abundant and most commonly occurring species along the outer shelf since sampling began. In contrast, densities of some numerically dominant polychaetes have been far more cyclical. For example, while *Myriochele* sp M and *Proclea* sp A were the most abundant polychaetes during 2003, their populations have varied considerably over time (see City of San Diego 2003). Such variation can have significant effects on other descriptive statistics (e.g., dominance, diversity, abundance) and environmental indices such as ITI and BRI which use the abundance of indicator species in their equations.

Classification of Benthic Assemblages

Classification analyses discriminated differences between five main benthic assemblages (cluster groups A–E, **Figure 5.2**). These assemblages differed in terms of their species composition, including the specific taxa present and their relative abundances. Sediment composition and benthic community structure parameters for each assemblage are given in **Table 5.3**. The dominant species for each assemblage are listed in **Table 5.4**.

<u>Cluster group A</u> represented all samples from station B10. The sediments at this station were mainly composed of sand and fine sediment. The ostracod *Euphilomedes producta* and the bivalves *Tellina cadieni* and *Parvilucina tenuisculpta* dominated this assemblage. The polychaete worm *Myriochele* sp M, a dominant species in all other cluster groups, was much less abundant here than elsewhere in the region.

<u>Cluster group B</u> included all samples from northern stations B12 and B13. Sediments at cluster group B were characterized as sandy silt with some coarse particles. As is typical of these sites, species richness was relatively high, approximately 106 species per 0.1 m^2. The gastropod *Caecum crebricinctum* was among the dominant animals in this assemblage. Other numerical dominant species included *Myriochele* sp M and the amphipod *Urothoe varvarini*. This cluster group had the highest average abundance of the ophiuroid *Amphiodia digitata* at ~10/0.1 m^2 (Table 5.4).

<u>Cluster group C</u> comprised all samples from station B11. This site is located along the 88–m depth contour and is one of the furthest stations from the outfall. The sediments at this site had the highest percentage of fine particles among all cluster groups (57% fines). The most abundant organisms were *Myriochele* sp M, *Amphiodia urtica* and *Monticellina siblina*.

<u>Cluster group D</u> comprised all samples from station E14 located nearest to the PLOO discharge. Sediments associated with cluster group D had a higher percentage of coarse particles (4.4%) and a lower percentage fine particles (30%) than the other groups. This assemblage was heavily dominated by the oweniid polychaete *Myriochele* sp M, which

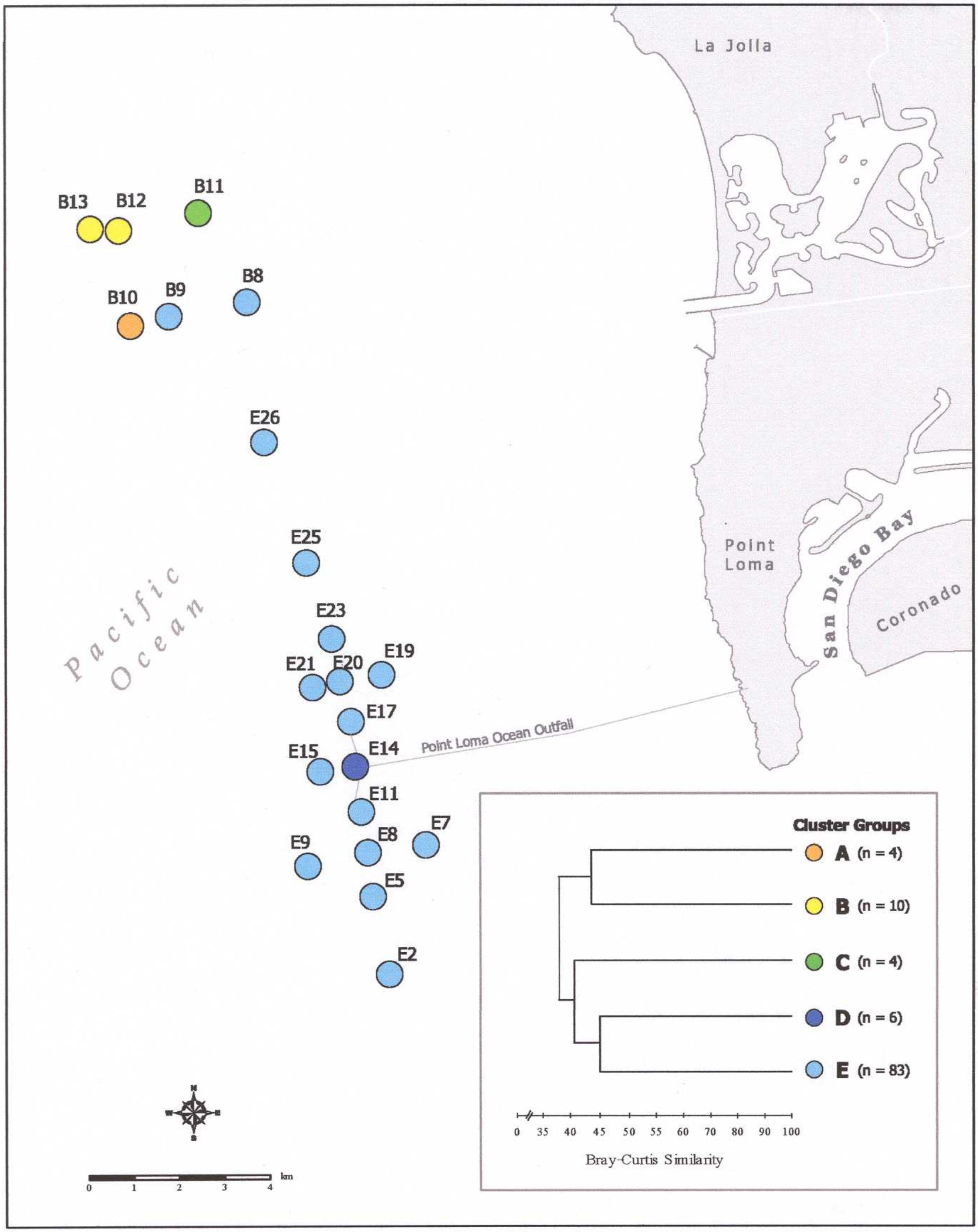

Figure 5.2
PLOO benthic stations sampled during 2003, color-coded to represent affiliation with benthic cluster groups.

Table 5.3

Depth, sediment composition, and macrobenthic community parameters for PLOO cluster groups during 2003. Sediment data are expressed as means per 0.1 m^2 grab over all stations in each group. Coarse = particles >1.0 mm; Fines = silt + clay fraction. Community structure data are expressed as annual means for: species richness (SR), no. species/0.1 m^2; total no. species per site; abundance/0.1 m^2; biomass, g/0.1 m^2; diversity (H'); evenness (J'); Swartz dominance, no. species comprising 75% of a community by abundance; benthic response index (BRI); and infaunal trophic index (ITI).

	A (n=4)	B (n=10)	C (n=4)	D (n=6)	E (n=83)	Mean	Range
Depth (m)	116	98 – 116	88	98	88 – 116	101	88 – 116
Sediment characteristics							
Phi	4.0	3.5	4.6	3.8	4.1	4.0	3.5 – 4.6
Coarse (%)	0.1	1.7	2.0	4.4	0.2	1.7	0.1 – 4.4
Sand (%)	67.3	67.0	41.5	65.2	60.6	60.3	41.5 – 67.3
Fines (%)	32.6	31.3	56.5	30.4	39.1	38.0	30.4 – 56.5
Community parameters							
SR	92	106	96	108	84	97	84 – 108
Total Spp.	126	151	135	149	118	136	118 – 151
Abundance	249	366	308	608	339	374	249 – 608
Biomass	2.7	3.9	4.3	2.7	5.2	3.8	2.7 – 5.2
H'	4.1	3.9	3.9	3.4	3.5	3.8	3.4 – 4.1
J'	1.1	1.0	1.0	0.8	0.9	1.0	0.8 – 1.1
Dominance	38	37	35	23	26	32	23 – 38
BRI	9	6	6	14	4	8	4 – 14
ITI	76	78	78	70	82	77	70 – 82

averaged over 205 individuals per 0.1 m^2 (Table 5.4). Three other polychaetes (*Myriochele gracilis*, *Chaetozone hartmanae*, *Chloeia pinnata*) and an ostracod (*Euphilomedes carcharodonta*) also were prominent. Though these species had mean abundances between 20–30 individuals per 0.1 m^2. The opportunistic polychaete *Capitella capitata* (spp. complex) was also present in this assemblage. When present in high numbers, this species is considered an indicator of organic enrichment (Reish 1971, Grassle and Grassle 1974, Pearson and Rosenberg 1978, Zmarzly et al. 1994). *Capitella capitata* was the sixth most numerous taxa in the group D assemblage, with a mean abundance of about 14 individuals per 0.1 m^2. About 90% of all *C. capitata* (83 of 92 individuals) collected in 2003 were found within cluster group D. Although *Amphiodia urtica* was present, it occurred in the lowest densities (1 per 0.1 m^2) compared to the other assemblages.

Cluster group E was the largest assemblage, comprising 78% samples during 2003. Silty sand comprised the sediments of this cluster group. This group averaged 339 individuals and 84 species per 0.1 m^2. Dominant species included *Myriochele* sp M, *Amphiodia urtica*, and the terebellid polychaete *Proclea* sp A.

SUMMARY and CONCLUSIONS

Benthic communities around the PLOO continue to be dominated by ophiuroid–polychaete based assemblages, with few major changes having occurred since monitoring began (see City of San Diego 1995, 2003). Polychaete worms continue to dominate the fauna in numbers of species and abundance, while ophiuroids compose the largest consistent biomass fraction. Although many of the 2003 assemblages were dominated by similar species, the relative abundance of these species varied between sites. The oweniid polychaete *Myriochele* sp M was dominant in all assemblages except cluster group A (the northern reference site B10). *Amphiodia urtica* was the second most abundant species and one of the

Table 5.4

Summary of the most abundant taxa composing cluster groups A–E from the PLOO benthic stations surveyed in 2003. Data are expressed as mean abundance per sample (no./0.1m^2) and represent the ten most abundant taxa in each group. Animals absent from a cluster group are indicated by a dash. Values for the three most abundant taxa in each cluster group are bolded.

		Cluster Group				
		A	B	C	D	E
Species/Taxa	Higher Taxa	(n=4)	(n=10)	(n=4)	(n=6)	(n=83)
Adontorhina cyclia	Mollusca: Bivalvia	7.0	0.4	1.8	1.2	2.4
Amphiodia digitata	Echinodermata: Ophiuroidea	8.0	9.5	0.5	0.5	1.0
Amphiodia sp	Echinodermata: Ophiuroidea	3.8	2.6	3.5	2.7	7.4
Amphiodia urtica	Echinodermata: Ophiuroidea	3.5	1.2	**18.8**	1.0	**37.5**
Caecum crebricinctum	Mollusca: Gastropoda	0.3	**38.7**	—	—	—
Capitella capitata (=spp complex)	Polychaeta: Capitellidae	—	0.1	—	13.8	0.1
Chaetozone hartmanae	Polychaeta: Cirratulidae	9.5	5.2	8.8	24.7	9.1
Chloeia pinnata	Polychaeta: Amphinomidae	1.0	8.0	—	20.0	2.9
Diastylis crenellata	Crustacea: Cumacea	6.8	1.4	1.0	2.3	2.8
Euphilomedes carcharodonta	Crustacea: Ostracoda	—	7.8	3.0	**24.8**	7.4
Euphilomedes producta	Crustacea: Ostracoda	**11.0**	7.3	—	10.8	5.5
Huxleyia munita	Mollusca: Bivalvia	1.3	7.3	—	3.2	1.3
Lysippe sp A	Polychaeta: Ampharetidae	2.5	1.7	5.5	2.2	1.2
Maldanidae	Polychaeta Maldanidae	1.3	3.2	5.0	6.0	3.3
Mediomastus sp	Polychaeta: Capitellidae	0.8	2.8	5.0	9.8	2.1
Monticellina siblina	Polychaeta: Cirratulidae	4.3	1.7	**9.0**	0.7	0.4
Myriochele gracilis	Polychaeta: Oweniidae	9.5	8.5	3.8	**29.5**	15.3
***Myriochele* sp M**	Polychaeta: Oweniidae	5.0	**43.0**	**59.5**	**207.2**	**67.0**
Nuculana elenensis	Mollusca: Bivalvia	0.8	—	0.5	12.2	1.5
Paradiopatra parva	Polychaeta: Onuphidae	7.0	5.6	5.5	4.7	4.8
Parvilucina tenuisculpta	Mollusca: Bivalvia	**10.3**	4.3	4.0	2.8	3.3
Phoronis sp	Phoronida	—	0.3	5.3	—	0.1
Prionospio (Prionospio) jubata	Polychaeta: Spionidae	3.5	7.4	5.5	—	2.7
***Proclea* sp A**	Polychaeta: Terebellidae	1.3	2.2	3.5	9.5	**22.7**
Rhepoxynius bicuspidatus	Crustacea: Amphipoda	2.3	0.2	1.3	1.8	4.9
Sternaspis fossor	Polychaeta: Sternaspidae	9.8	1.0	5.0	2.8	5.2
Tellina cadieni	Mollusca: Bivalvia	**10.8**	3.0	2.0	4.2	2.0
Urothoe varvarini	Crustacea: Amphipoda	3.5	**15.0**	—	—	0.2

most widespread benthic invertebrates in the region, being dominant or co–dominant in assemblages that comprised 81% of the samples surveyed in 2003. Assemblages similar to those off Point Loma have been described for other areas in the Southern California Bight (SCB) by Barnard and Ziesenhenne (1961), Jones (1969), Fauchald and Jones (1979), Thompson et al. (1987, 1992, 1993), Zmarzly et al. (1994), Diener and Fuller (1995), and Bergen et al. (1998, 2000).

Although variable, benthic communities off Point Loma generally have remained similar between years in terms of the number of species, number of individuals, biomass, and dominance (City of San Diego 1995, 2003). In addition, values for these parameters in 2003 were similar to those described for other sites throughout the SCB (e.g., Thompson et al. 1992, Bergen et al. 1998, 2001). In spite of this overall stability, there has been an increase in the number of species and macrofaunal abundances since discharge began (see City of San Diego 1995, 2003). However, the increase in species has been most pronounced nearest the outfall, a pattern suggesting that significant environmental degradation is not occurring. In addition, the observed increases in abundance at most stations have been accompanied by decreases in dominance, patterns inconsistent with predicted pollution effects. Whatever the cause of such changes, benthic communities around the PLOO are not numerically dominated by a few pollution tolerant species.

Changes near the outfall suggest some effects coincident with anthropogenic activities. Indicative of organic enrichment or disturbance was a decrease in the infaunal trophic index (ITI) at station E14 after discharge began (see City of San Diego 1995, 2003). In addition, benthic response index (BRI) values are higher at E14 than at other sites in the region. However, both ITI and BRI values at this and all other sites are still characteristic of undisturbed areas. The instability or patchiness of sediments near the PLOO and the corresponding shifts in assemblages suggest that changes in this area may be related to localized physical disturbance (e.g., shifting sediment types) associated with the structure of the outfall pipe as well as to organic enrichment associated with the discharge of effluent.

While it is difficult to detect specific effects of the Point Loma Ocean Outfall on the offshore benthos, it is possible to see some changes occurring near the discharge site (i.e., E14). Because of the minimal extent of these changes, it has not been possible to determine whether any effect is due to the physical structure of the outfall pipe or to organic enrichment in the area. Such impacts have spatial and temporal dimensions that vary depending on a range of biological and physical factors. In addition, abundances of soft bottom invertebrates exhibit substantial spatial and temporal variability that may mask the effects of any disturbance event (Morrisey et al. 1992a, 1992b, Otway 1995). The effects associated with the discharge of advanced primary treated (APT) and secondary treated sewage may also be negligible or difficult to detect in areas subjected to strong currents that facilitate the dispersion of the wastewater plume (see Diener and Fuller 1995). The high level of wastewater treatment (advanced primary treatment), combined with a minimum dilution factor of 204:1 and deeper location of the discharge (vs. 113:1 at the 220ft deep outfall prior to 1993), may decrease the chances that the PLOO will significantly impact the nearby benthos. The minimal impact reported for the original shallower discharge area off Point Loma supports this conclusion (e.g., Zmarzly et al. 1994). Although some changes in benthic assemblages have appeared near the outfall, assemblages in the region are still similar to those observed prior to discharge and to natural indigenous communities characteristic of the southern California continental shelf.

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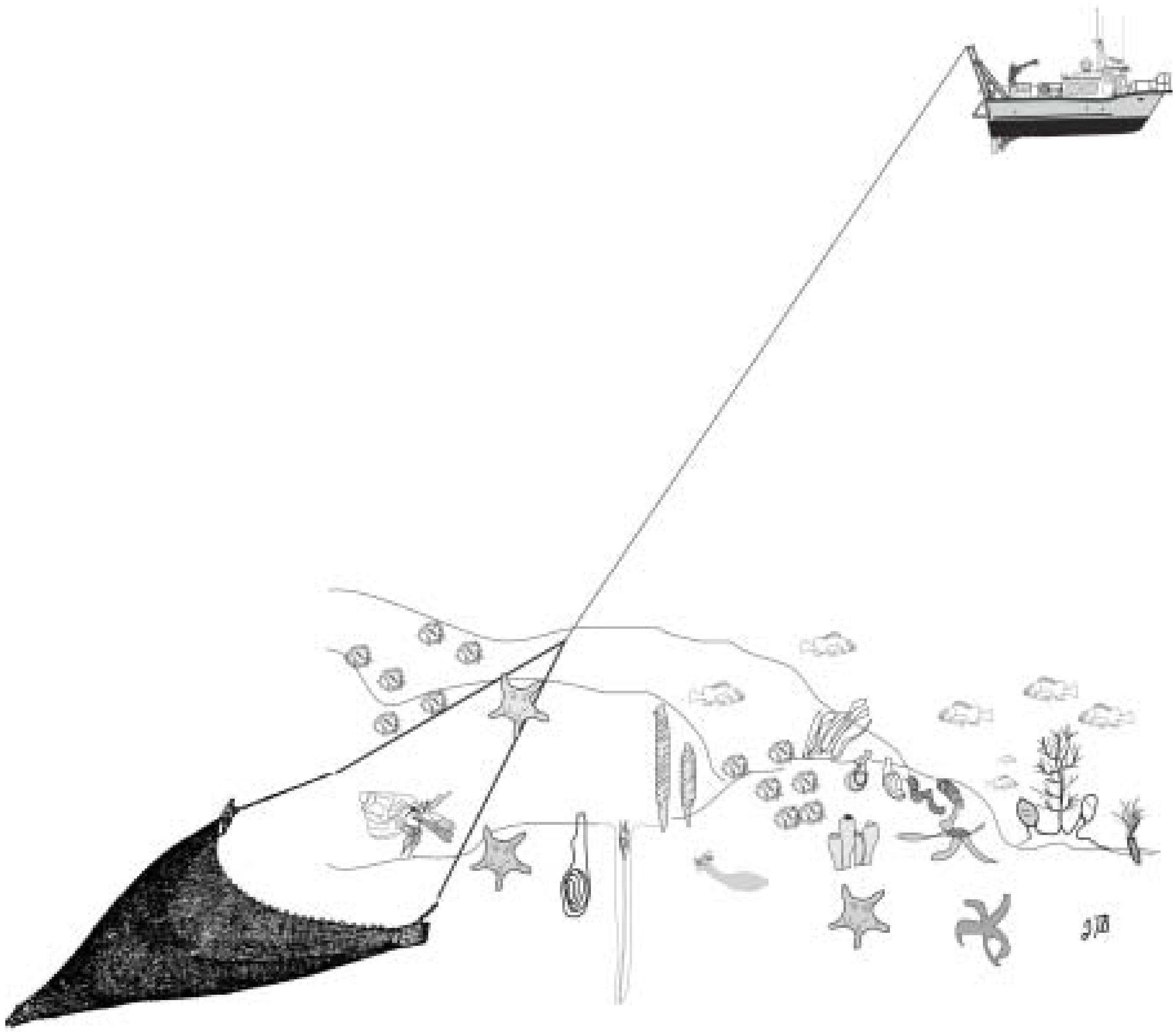
Demersal Fishes and Megabenthic Invertebrates



Chapter 6. Demersal Fishes and Megabenthic Invertebrates

INTRODUCTION

Demersal fishes and megabenthic invertebrates are conspicuous components of soft-bottom habitats of the mainland shelves and slopes off southern California. More than 100 species of fish inhabit the Southern California Bight (SCB) (Allen 1982, Allen et al. 1998), while the megabenthic invertebrate fauna consists of more than 200 species (Allen et al. 1998). For the Point Loma region off San Diego, the most common trawl-caught fishes include Pacific sanddab, longfin sanddab, Dover sole, hornyhead turbot, California tonguefish, plainfin midshipman, and yellowchin sculpin. The common trawl-caught invertebrates include relatively large species such as sea urchins and sea stars.

Communities of bottom dwelling fish and invertebrates have become an important focus of monitoring programs throughout the world. For example, these organisms have been sampled extensively on the SCB mainland shelf for more than 30 years, primarily by programs associated with municipal wastewater and power plant discharges (Cross and Allen 1993). Although much is known about the condition of these types of assemblages (e.g., Allen et al. 1998), additional studies are useful in documenting community structure and stability, and may provide insight into the effects associated with anthropogenic and natural influences.

The City of San Diego Ocean Monitoring Program was designed to monitor the effects of the Point Loma Ocean Outfall (PLOO) on the local marine biota. This chapter presents analyses and interpretation of demersal fish and megabenthic invertebrate data collected under this program during 2003. A long-term analysis of changes in these communities from 1992 through 2003 is also presented.

MATERIALS and METHODS

Field Sampling

A total of 25 trawls were performed during three surveys off Point Loma in 2003. The trawling area extends from about eight km north to nine km south of the outfall. Three inshore stations (SD1, SD3, SD6), located along the 60-m depth contour, were sampled during January. Offshore stations (SD7–SD14), located along the 100-m contour, were sampled during January, April and July (Figure 6.1). Due to changes in the NPDES permit, the three inshore stations and two offshore stations (SD9 and SD11) were not sampled in July (see Chapter 1, Appendix A). A single trawl was performed at each station using a 7.6-m Marinovich otter trawl fitted with a 1.3-cm cod-end mesh net. The net was towed for 10 minutes bottom time at a speed of about 2.5 knots along a predetermined heading. Detailed methods for locating the stations and conducting trawls are described in the City of San Diego Quality Assurance Manual (City of San Diego 2004).

Trawl catches were brought on board for sorting and inspection. All organisms were identified to species or to the lowest taxon possible. If an animal could not be identified in the field, it was returned to the laboratory for further identification. The total number of individuals and the total biomass (wet weight, kg) were recorded for each species of fish. Additionally, each fish was inspected for the presence of external parasites or physical anomalies (e.g., tumors, fin erosion, discoloration) and measured to the nearest centimeter according to standard protocols (see City of San Diego 2004). The total number of individuals was also recorded for each species of invertebrate. Due to the small size of most organisms, invertebrate biomass was typically measured as a composite wet weight (kg) of all species combined; however, large or exceptionally abundant species were weighed separately. When the white sea urchin *Lytechinus pictus* was collected in

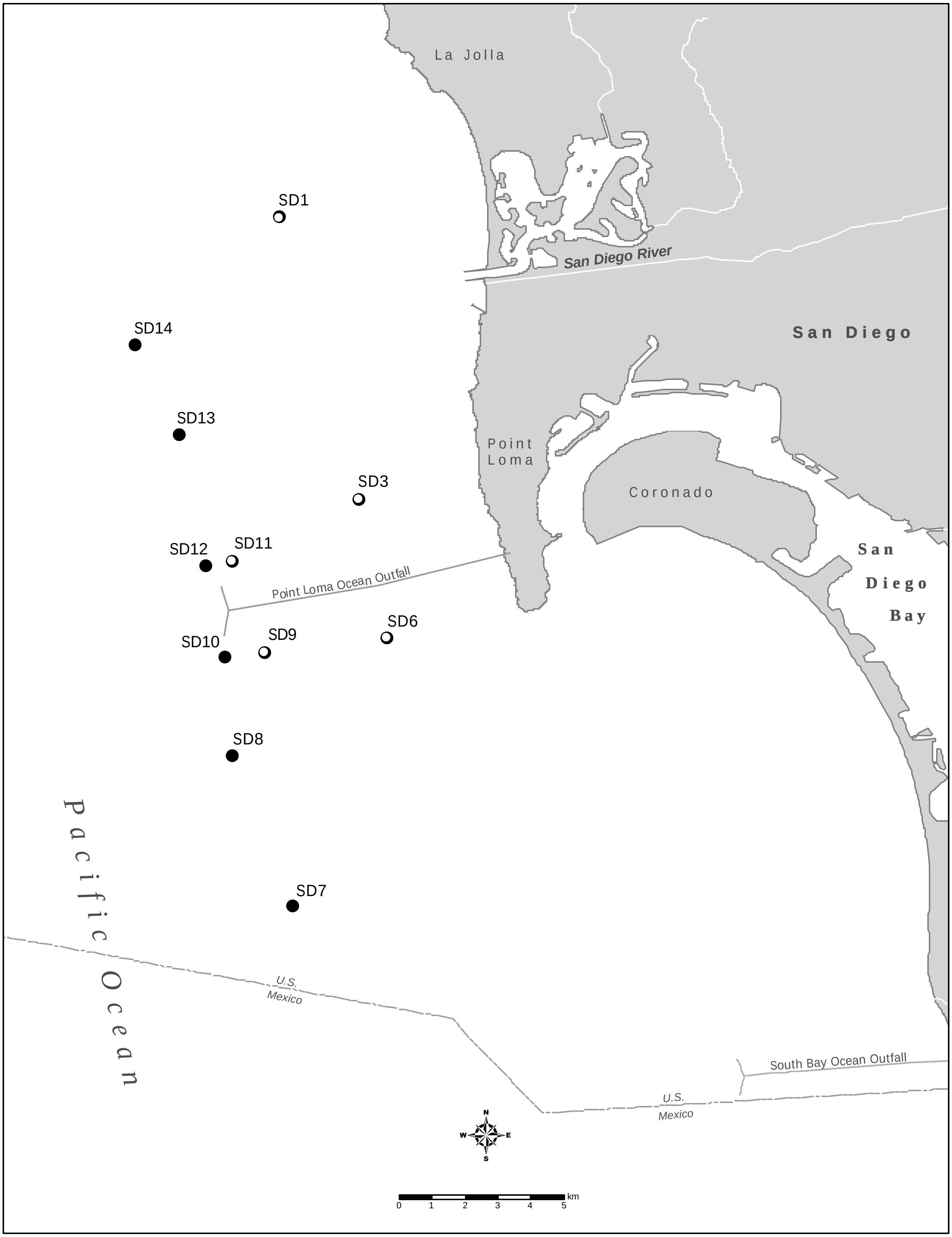


Figure 6.1
Otter trawl station locations, Point Loma Ocean Outfall Monitoring Program.

Table 6.1

Demersal fish species collected in 22 trawls in the PLOO region during 2003. Data for each species are expressed as: (1) percent abundance (PA); (2) frequency of occurrence (FO); (3) mean abundance per occurrence (MAO).

Species	PA	FO	MAO	Species	PA	FO	MAO
Pacific sanddab	54	100	176	Hornyhead turbot	<1	27	1
Yellowchin sculpin	19	77	81	California skate	<1	23	1
Longspine combfish	5	82	18	Spotted cuskeel	<1	23	2
Dover sole	5	95	16	Pacific argentine	<1	18	5
Stripetail rockfish	3	77	11	Rockfish unidentified	<1	18	2
Longfin sanddab	2	50	13	Flag rockfish	<1	14	1
California scorpionfish	2	59	11	Flatfish unidentified	<1	14	6
California tonguefish	2	100	5	Greenspotted rockfish	<1	14	1
Pink seaperch	1	82	6	Gulf sanddab	<1	14	2
Plainfin midshipman	1	77	6	Pygmy poacher	<1	14	2
Shortspine combfish	1	77	5	Roughback sculpin	<1	14	3
Blackbelly eelpout	1	18	14	Blackeye goby	<1	9	1
Slender sole	1	32	7	Stripedfin ronguil	<1	9	1
English sole	1	41	5	Blacktip poacher	<1	5	1
Halfbanded rockfish	1	55	4	Cowcod	<1	5	2
Spotfin sculpin	1	23	9	Greenblotched rockfish	<1	5	1
Bay goby	<1	32	2	King-of-the-salmon	<1	5	1
Bigmouth sole	<1	32	1	Lumptail searobin	<1	5	1
California lizardfish	<1	32	4	Pacific hake	<1	5	1
Bluespotted poacher	<1	27	1	Sculpin unidentified	<1	5	1
Greenstriped rockfish	<1	27	2	White croaker	<1	5	1

large numbers, its abundance was estimated by multiplying the total number of individuals per 1.0 kg subsample by the total urchin biomass.

Data Analyses

Because the inshore stations were only sampled in January, data analysis for these stations was limited to the summary included in **Appendix C.1**. Populations of each fish and invertebrate species from the offshore stations were summarized in terms of percent abundance (number of individuals/total of all individuals caught x 100), frequency of occurrence (number of occurrences/total number of trawls x 100) and mean abundance per occurrence (number of individuals/number of occurrences). In addition, the following parameters were calculated for both the fish and invertebrate assemblages at each station: (1) species richness (number of species); (2) total abundance; (3) Shannon diversity index (H'); (4) total biomass (fish only).

Multivariate analyses were performed on the eight offshore stations using PRIMER (Plymouth Routines in Multivariate Ecological Research) software to examine spatio-temporal patterns in the overall similarity of benthic assemblages in the region (see Clarke 1993, Warwick 1993). These analyses included classification (cluster analysis) by hierarchical agglomerative clustering with group-average linking, and ordination by non-metric multidimensional scaling (MDS). The fish abundance data were square-root transformed and the Bray-Curtis measure of similarity was used as the basis for both classification and ordination. Patterns in the distribution of the demersal assemblages were examined using MDS plots and analysis of similarities (ANOSIM) (see Field et al. 1982).

RESULTS

Fish Community

A total catch of 7,182 fishes, representing thirty-nine species, was collected in the area surrounding the PLOO

Table 6.2

Summary of demersal fish community parameters sampled during 2003. Data are expressed as (1) total number of species; (2) mean number of species; (3) mean abundance; (4) mean diversity (H'); (5) mean biomass (BM) (kg, wet weight); n = 3 except for station SD9 and SD11, where n = 2.

	No. of Species				
Station	Total	Mean	Abund	H'	BM
SD7	24	14	236	1.17	3.3
SD8	27	15	156	1.63	3.2
SD9	16	11	220	1.72	10.0
SD10	26	15	314	1.24	9.6
SD11	19	15	364	1.75	10.4
SD12	21	12	403	1.42	7.5
SD13	25	16	508	1.19	9.4
SD14	27	16	387	1.16	10.5

during 2003 (**Table 6.1, Appendix C.2**). The Pacific sanddab was the most abundant fish collected. This species comprised 54% of the total catch for the year and was present in all hauls. Other frequently occurring species included yellowchin sculpin, longspine combfish, Dover sole, stripetail rockfish, longfin sanddab, California scorpionfish, California tonguefish, pink seaperch, plainfin midshipman, shortspine combfish, and halfbanded rockfish.

Measurements of community structure varied among the stations in 2003 (**Table 6.2, Appendix C.3**). For example, mean abundance ranged from 156 to 508 fish per haul at the eight offshore stations. The largest hauls, which occurred at stations SD12–SD14, reflected substantial numbers of both yellowchin sculpin (January) and Pacific sanddab (January and July). Total fish biomass was also highly variable, and ranged from 2 to 18 kg per station (Appendix C.3). The higher values were largely due to hauls with high numbers of fish (e.g., Pacific sanddabs) or a few large fish (e.g., California scorpionfish). In contrast, species richness and diversity (H') values differed among stations, both were relatively low. The mean number of species was 16 or less at all stations and average diversity (H') values were all below 2.

Demersal fish communities have also varied over time off Point Loma, although the changes do not appear to be associated with the initiation of discharge (**Figure 6.2**). For example, mean species richness has remained fairly consistent at between 10–20 species per station, while mean abundances have fluctuated substantially over the years (between 93–690 individuals). These fluctuations in abundance have been greatest at stations SD9–SD14, and generally reflect differences in the populations of the dominant species, especially the Pacific sanddab.

Ordination and classification of analyses of sites resulted in four major clusters (station groups 1–4) during 2003 (see **Figure 6.3**). The dominant species composing each group are listed in Table 6.3. These assemblages differed in terms of their species composition, primarily reflecting different numbers of the more common species. For example, station group 3 included all but one site sampled in January. The dominant fish from this assemblage included Pacific sanddabs (156 individuals per haul) and yellowchin sculpin (180 individuals per haul). In contrast, station group 2, which included all but two sites sampled in April and July, averaged 216 Pacific sanddabs and only 7 yellowchin sculpin per haul. Station groups 1 and 4 included samples from SD8 (January and April) and SD9 (April). These sites had lower overall abundances, but particularly lower abundances of Pacific sanddabs. No patterns were evident that suggest changes in the fish assemblages were associated with the PLOO.

Physical Abnormalities and Parasitism

The presence of physical abnormalities and parasites were rare on fishes collected off Point Loma in 2003. For example, there was only one instance of a physical abnormality. A single California scorpionfish was collected with blackspots at SD11 in January. The rate of parasitism was <2% overall. The highest rate of infestation (3%) occurred in Pacific sanddabs. The copepod eye parasite *Phrixocephalus cincinnatus* was the most prevalent parasite. It occurred on Pacific sanddabs collected at all stations during all surveys. The ectoparasitic isopod, *Elthusa vulgaris*, also occurred in several trawls. However its host fish is unknown because this isopod becomes detached from its host during sorting. Although *E. vulgaris* occurs on a wide variety of fish species off of southern

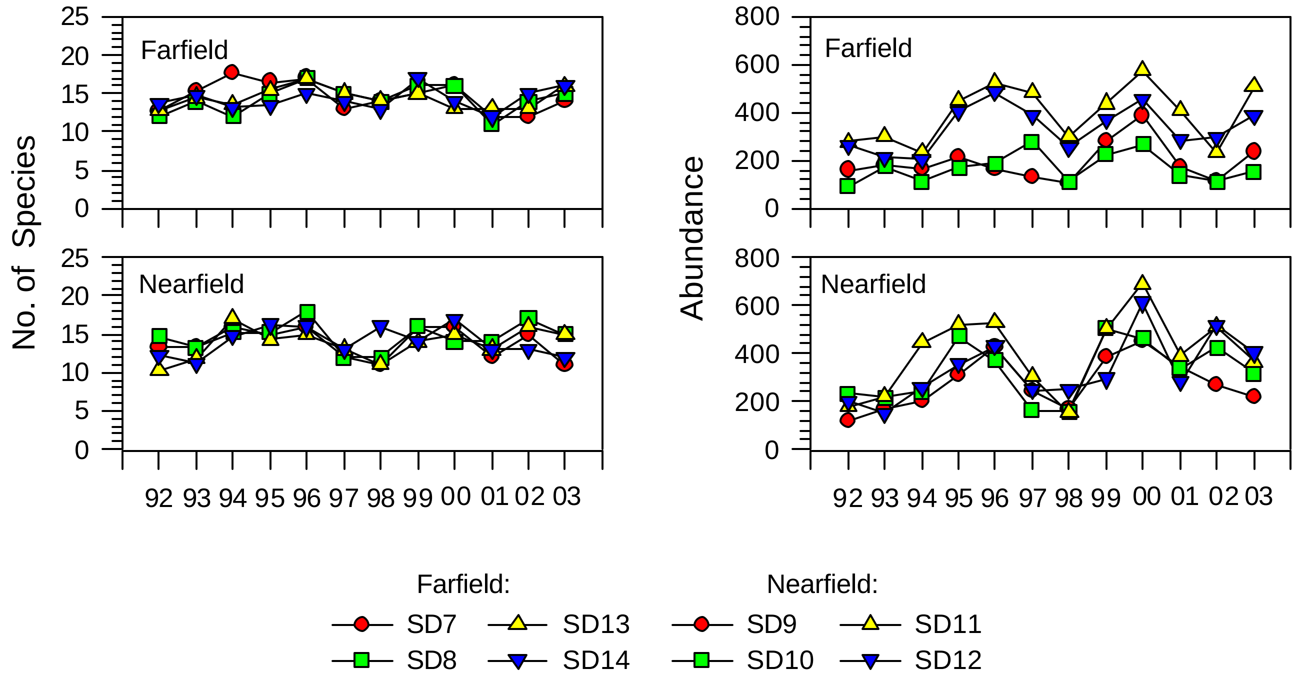


Figure 6.2

Annual mean number of fish species and abundance per station, 1992 through 2003; n = 4 except for 2003 when n = 3 for SD7,SD8, SD10, SD13, SD14 and n = 2 for SD9 and SD11.

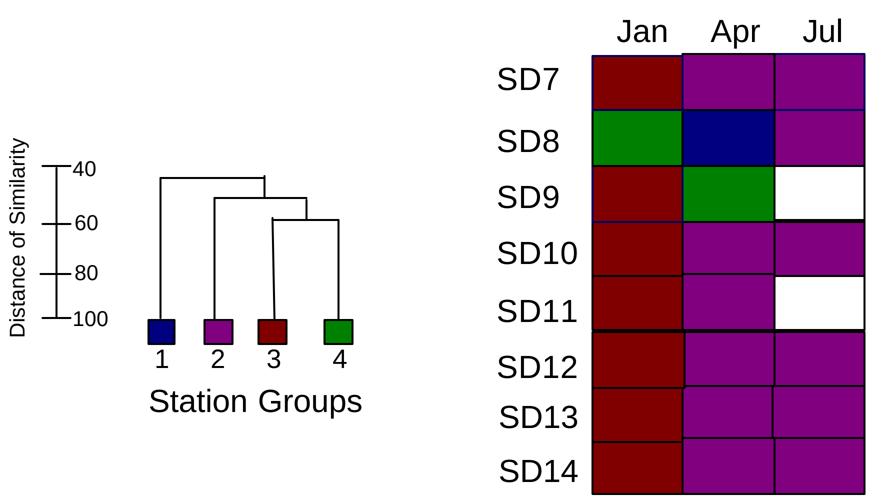


Figure 6.3

Classification analyses of demersal fish collected from offshore stations sampled during 2003. Data are presented as a dendrogram of major station groups and a matrix showing distribution over time.

Table 6.3

Summary of the main station cluster groups for the 2003 survey. Data include number of hauls, mean number of species, mean number of individuals, as well as the distribution of abundant and frequently occurring fish species in each group. Most abundant species in bold.

	SG1	SG2	SG3	SG4
Number of hauls	1	12	7	2
Mean no. of species per haul	15	15	14	14
Mean no. of individuals per haul	76	317	427	157
Species	**Mean Abundance**			
Pacific sanddab	**35**	**216**	**156**	**75**
Spotfin sculpin	**15**	—	—	**12**
Shortspine combfish	**6**	—	—	**10**
Dover sole	**5**	**24**	4	5
California tonguefish	3	—	7	11
Plainfin midshipman	3	6	—	4
California scorpionfish	1	4	15	—
Blackeye goby	1	—	—	—
Bluespotted poacher	1	—	—	—
Greenspotted rockfish	1	—	—	—
Yellowchin sculpin	—	7	**180**	**17**
Longspine combfish	—	**16**	**19**	—
Longfin sanddab	—	—	**18**	4
Stripetail rockfish	—	**10**	6	**12**
Pink seaperch	—	7	—	—
Blackbelly eelpout	—	5	—	—
Slender sole	—	4	—	—
California lizardfish	—	—	4	—
English sole	—	—	6	2

California, it is especially common on sanddabs and California lizardfish, where it may reach infestation rates of 3% and 80%, respectively (Brusca 1978, 1981). Other unidentified parasites were found on two California scorpionfish and a single gulf sanddab.

Invertebrate Community

A total of 54,556 megabenthic invertebrates, representing 56 taxa, were collected during 2003 (**Table 6.4**). The white sea urchin *Lytechinus pictus* was the most abundant and most frequently captured species. It was present in 95% of the trawls and accounted for 97% of the total invertebrate catch. Other species that occurred in at least half of the hauls included the sea pen *Acanthoptilum* sp, the sea stars *Astropecten verrilli* and *Luidia foliolata*, the brittle star *Ophiura luetkenii*, the sea cucumber *Parastichopus californicus*, and the squid *Rossia pacifica*.

Species richness and abundances were variable among the eight offshore stations during the year (**Table 6.5**). For example, the mean number of species per station ranged from 7 to 19, while mean abundance per station averaged from 40 to 6,741 individuals. The largest hauls occurred at stations SD8 and SD10, primarily due to large numbers of the urchin *L. pictus*.

Invertebrate species richness and abundance also varied over time (Figure 6.4). Species richness has ranged from 5 and 20 species at most stations since 1992, although the patterns of change have been similar among stations. In contrast, changes in abundance differed among stations. For example, two stations (i.e., SD13 and SD14) had relatively small catches of invertebrates during each year, while the remaining

Table 6.4

Megabenthic invertebrate species collected in 22 trawls in the PLOO region during 2003. Data for each species are expressed as: (1) percent abundance (PA); (2) frequency of occurrence (FO); (3) mean abundance per occurrence (MAO).

Species	PA	FO	MAO	Species	PA	FO	MAO
Lytechinus pictus	97	95	2530	*Loxorhynchus grandis*	<1	9	2
Acanthoptilum sp	2	68	55	*Luidia asthenosoma*	<1	14	1
Astropecten verrilli	<1	82	5	*Neocrangon resima*	<1	9	2
Parastichopus californicus	<1	86	4	*Ophiothrix spiculata*	<1	5	3
Luidia foliolata	<1	55	4	*Pleurobranchaea californica*	<1	9	2
Crangon alaskensis	<1	32	6	*Calliostoma turbinum*	<1	9	1
Thesea sp B	<1	45	5	*Excorallana truncata*	<1	9	1
Rossia pacifica	<1	50	2	*Hemisquilla ensigera californiensis*	<1	9	1
Ophiura luetkenii	<1	50	2	*Heptacarpus tenuissimus*	<1	9	1
Loligo opalescens	<1	32	3	*Platydoris macfarlandi*	<1	9	1
Nymphon pixellae	<1	27	3	*Tritonia diomedea*	<1	5	2
Platymera gaudichaudii	<1	45	2	*Amphiodia urtica*	<1	5	1
Neocrangon zacae	<1	27	3	*Antiplanes catalinae*	<1	5	1
Philine auriformis	<1	27	3	*Astropecten ornatissimus*	<1	5	1
Megasurcula carpenteriana	<1	27	2	*Astropecten* sp	<1	5	1
Ophiopholis bakeri	<1	14	5	*Cancellaria cooperii*	<1	5	1
Octopus rubescens	<1	32	2	*Ceramaster patagonicus*	<1	5	1
Florometra serratissima	<1	14	3	*Cucumaria piperata*	<1	5	1
Amphichondrius granulatus	<1	18	2	*Eugorgia rubens*	<1	5	1
Armina californica	<1	18	2	*Mediaster aequalis*	<1	5	1
Elthusa vulgaris	<1	18	1	*Nassarius insculptus*	<1	5	1
Metridium senile *	<1	23	1	*Ophiacantha diplasia*	<1	5	1
Paguristes turgidus	<1	14	2	PAGURIDAE	<1	5	1
Sicyonia ingentis	<1	18	1	*Palicus cortezi*	<1	5	1
Spatangus californicus	<1	5	5	*Polinices draconis*	<1	5	1
Allocentrotus fragilis	<1	18	1	PORIFERA	<1	5	1
Fusinus barbarensis	<1	14	1	*Rathbunaster californicus*	<1	5	1
Loxorhynchus crispatus	<1	14	1	*Styela* sp	<1	5	1

*Species complex

stations demonstrated large peaks in abundance at various times. These fluctuations typically reflect changes in the dominant echinoderm populations, especially that of *L. pictus*. None of the observed variability in the invertebrate community could be attributed to the initiation of discharge from the Point Loma outfall.

SUMMARY and CONCLUSIONS

As in previous years, the structure of the demersal fish and megabenthic invertebrate communities varied among stations, generally due to population fluctuations of various dominant species. Pacific sanddabs, which were present in every haul, dominated the fish assemblages surrounding the Point Loma Ocean Outfall during 2003. Other fish, such as the yellowchin sculpin, longspine combfish, Dover sole, stripetail rockfish, longfin sanddab, California scorpionfish, California tonguefish, pink seaperch, plainfin midshipman, shortspine combfish, and halfbanded rockfish were also collected frequently, but in much lower numbers.

Invertebrate assemblages were also dominated by a few species. The white sea urchin *Lytechinus pictus* was the most wide-spread and most abundant

Table 6.5

Megabenthic invertebrate community parameters sampled during 2003. Data are expressed as (1) total number of species; (2) mean number of species; (3) mean abundance (Abund); (4) mean diversity (H'); n = 3 except for station SD9 and SD11, where n = 2.

	Number of Species			
Station	Total	Mean	Abund	H'
SD7	19	11	396	0.64
SD8	36	19	6741	0.06
SD9	19	12	40	2.10
SD10	19	10	6061	0.08
SD11	16	12	329	1.01
SD12	22	12	3008	0.32
SD13	18	10	1324	0.20
SD14	15	7	410	0.30

species, representing 97% of the total invertebrate catch. The sea pen *Acanthoptilum* sp, the sea stars *Astropecten verrilli* and *Luidia foliolata*, the sea cucumber *Parastichopus californicus*, the brittle star *Ophiura luetkenii*, and the squid *Rossia pacifica* also occurred frequently, but in much lower numbers.

These inherently variable communities are subject to influences of both anthropogenic and natural factors. Anthropogenic influences include inputs associated with ocean outfall discharges and storm drain runoff. Natural factors may include prey availability (Cross et al. 1985), bottom relief and sediment structure (Helvey and Smith 1985), and changes in water temperature associated with large scale oceanographic events such as El Niño/La Niña events (Karinen et al. 1985). The observed changes in communities off Point Loma were more likely due to natural factors, which can impact the migration of adult fish or the recruitment of juveniles into an area (Murawski 1993). Population fluctuations

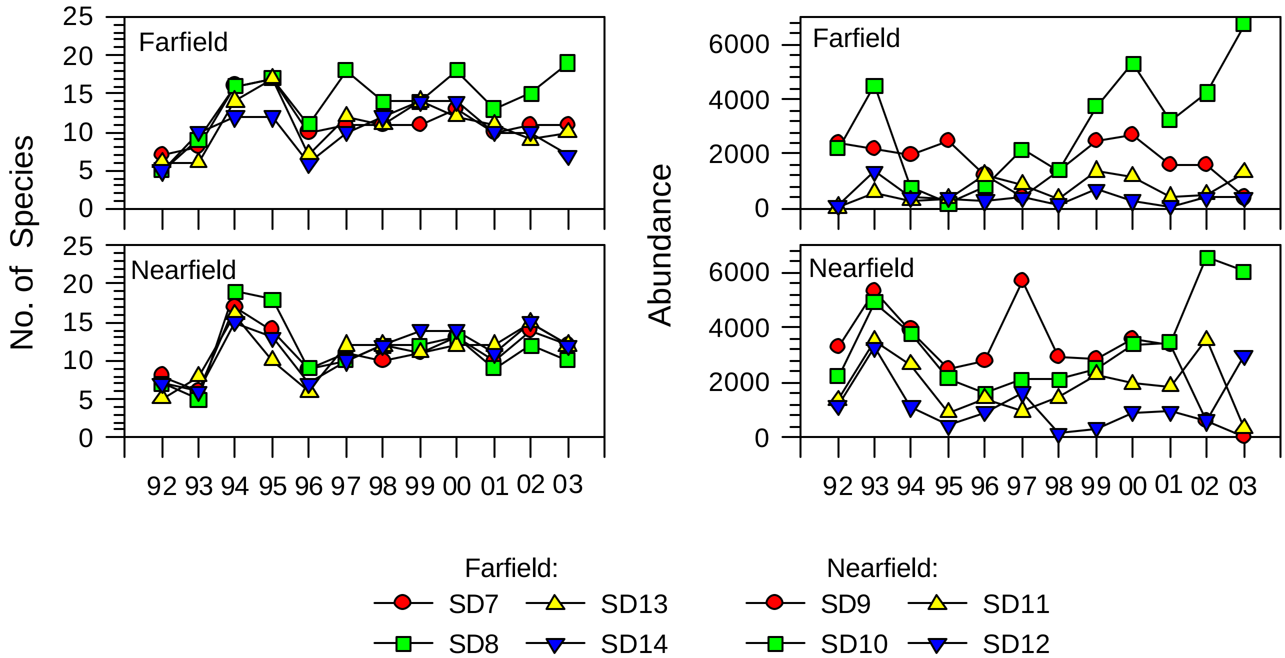


Figure 6.2

Annual mean number of invertebrate species and abundance per station, 1992 through 2003; n = 4 except for 2003 when n = 3 for SD7,SD8, SD10, SD13, SD14 and n = 2 for SD9 and SD11.

may also be due to the mobile nature of many species (e.g., schools of fish or aggregations of urchins).

Overall, there was no evidence that the discharge of wastewater from the Point Loma Ocean Outfall in 2003 affected either the fish or megabenthic invertebrate communities in the region. Despite the variable structure of these assemblages, patterns of species diversity, abundance, and biomass at stations near the outfall were similar to sites located further away. In addition, no changes were found in these assemblages that corresponded to the initiation of wastewater discharge (City of San Diego 1994). Furthermore, the absence physical abnormalities on local fishes suggest that populations in the area are healthy.

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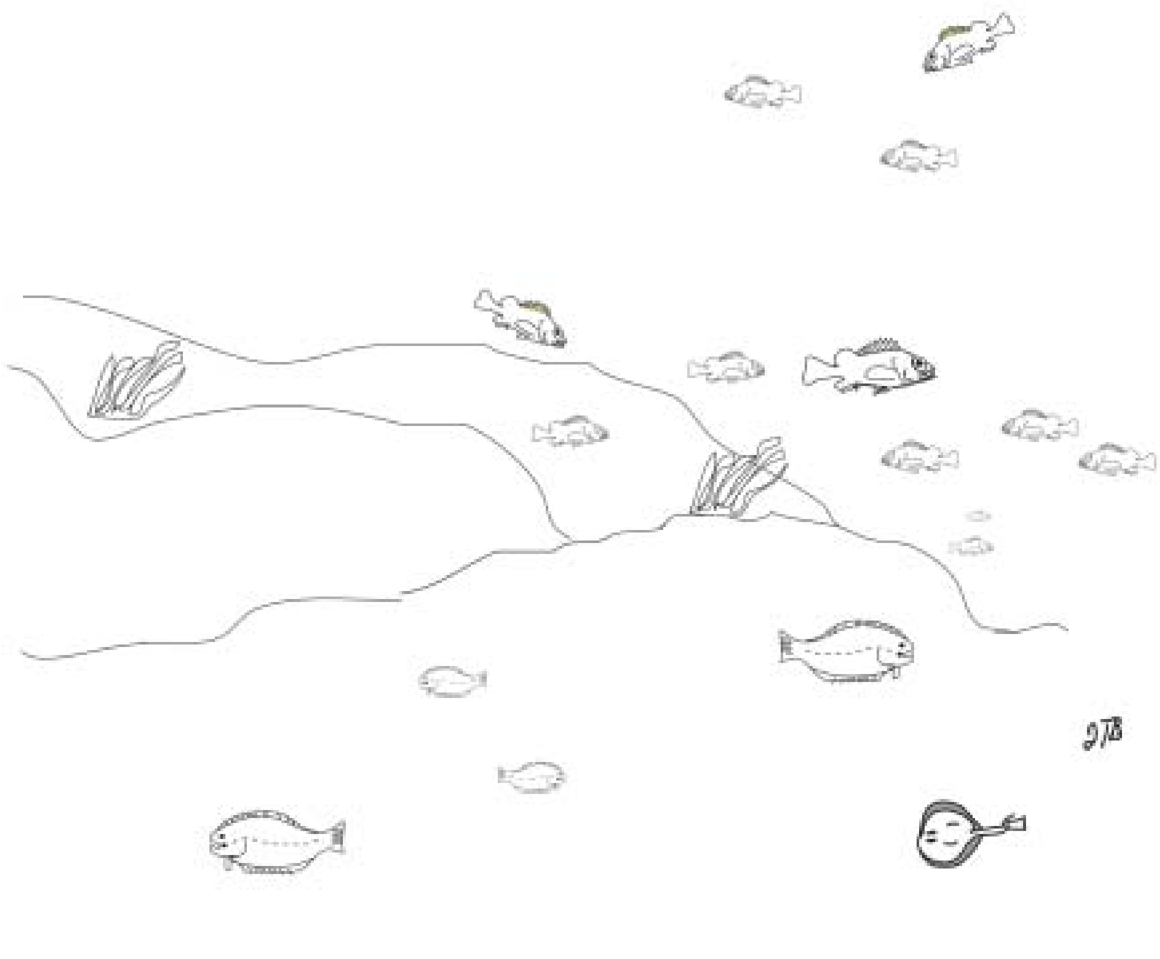
Bioaccumulation of Contaminants in Fish Tissues



Chapter 7: Bioaccumulation of Contaminants in Fish Tissues

INTRODUCTION

Bottom dwelling (i.e., demersal) fishes are collected as part of the Point Loma Ocean Outfall (PLOO) monitoring program to assess the accumulation of contaminants in their tissues. The bioaccumulation of contaminants in fish occurs through biological uptake and retention of chemical contaminants derived from various exposure pathways (Tetra Tech 1985). Exposure routes for these fishes include the adsorption or absorption of dissolved chemical constituents from the water and the ingestion and assimilation of pollutants from food sources. They also accumulate pollutants by ingesting pollutant-containing suspended particulate matter or sediment particles. Demersal fish are useful in biomonitoring programs because of their proximity to bottom sediments. For this reason, levels of contaminants in tissues of demersal fish are often related to those found in the environment (Schiff and Allen 1997).

The bioaccumulation portion of the PLOO monitoring program consists of two components: (1) analysis of liver tissues from trawl-caught fishes; (2) analysis of muscle tissues from fishes collected by rig fishing. Fishes collected from trawls are considered representative of the demersal fish community, and certain species are targeted based on their ecological significance (i.e., prevalence in the community). Chemical analyses are performed using livers because this is where contaminants typically concentrate due to physiological role of the liver and the high lipid levels found there. In contrast, fishes targeted for collection by rig fishing represent a typical sport fisher's catch. Muscle tissue is analyzed from these fishes because it is the tissue most often consumed by humans and therefore the results are pertinent to human health concerns.

All muscle and liver samples were analyzed for contaminants as specified in the NPDES discharge permits for the PLOO monitoring program. Most of these contaminants are also included in the NOAA National Status and Trends Program. NOAA initiated this program to detect changes in the environmental quality of our nation's estuarine and coastal waters by tracking contaminants thought to be of concern for the environment (Lauenstein and Cantillo 1993). This chapter presents the results of all tissue analyses that were performed during 2003.

MATERIALS and METHODS

Collection

Fishes were collected during April and October 2003 at several trawl (SD7–SD14) and rig fishing stations (RF1 and RF2) (**Figure 7.1**). In accordance with changes to the PLOO NPDES permit that became effective in August 2003 (see Chapter 1, Appendix A), these stations were grouped into different zones for the October survey. However, for ease of interpretation, the data were analyzed by zone for both the April and October surveys. Zone 1 includes the stations located around the PLOO (SD9–SD12 for April, SD10, SD12 for October); Zone 2 includes stations located to the north of the outfall (SD13 and SD14, both surveys); Zone 3 is located near the LA-5 dredged materials disposal site (SD8, both surveys); Zone 4 is located south of the outfall (SD7, both surveys). Trawl-caught fishes were collected, measured and weighed following established guidelines as described in Chapter 6 of this report. Fishes were collected at rig fishing sites primarily using rod and reel fishing tackle following standard procedures (City of San Diego 2004a). Fish traps may have been used at the rig fishing sites to facilitate the collection of fish. Only fish >12 cm standard length were retained for tissue analyses. These fish were sorted into composite samples, each containing a minimum of three individuals. They were then wrapped in aluminum foil, labeled, put in ziplock bags, and placed on dry ice for transport to the Marine

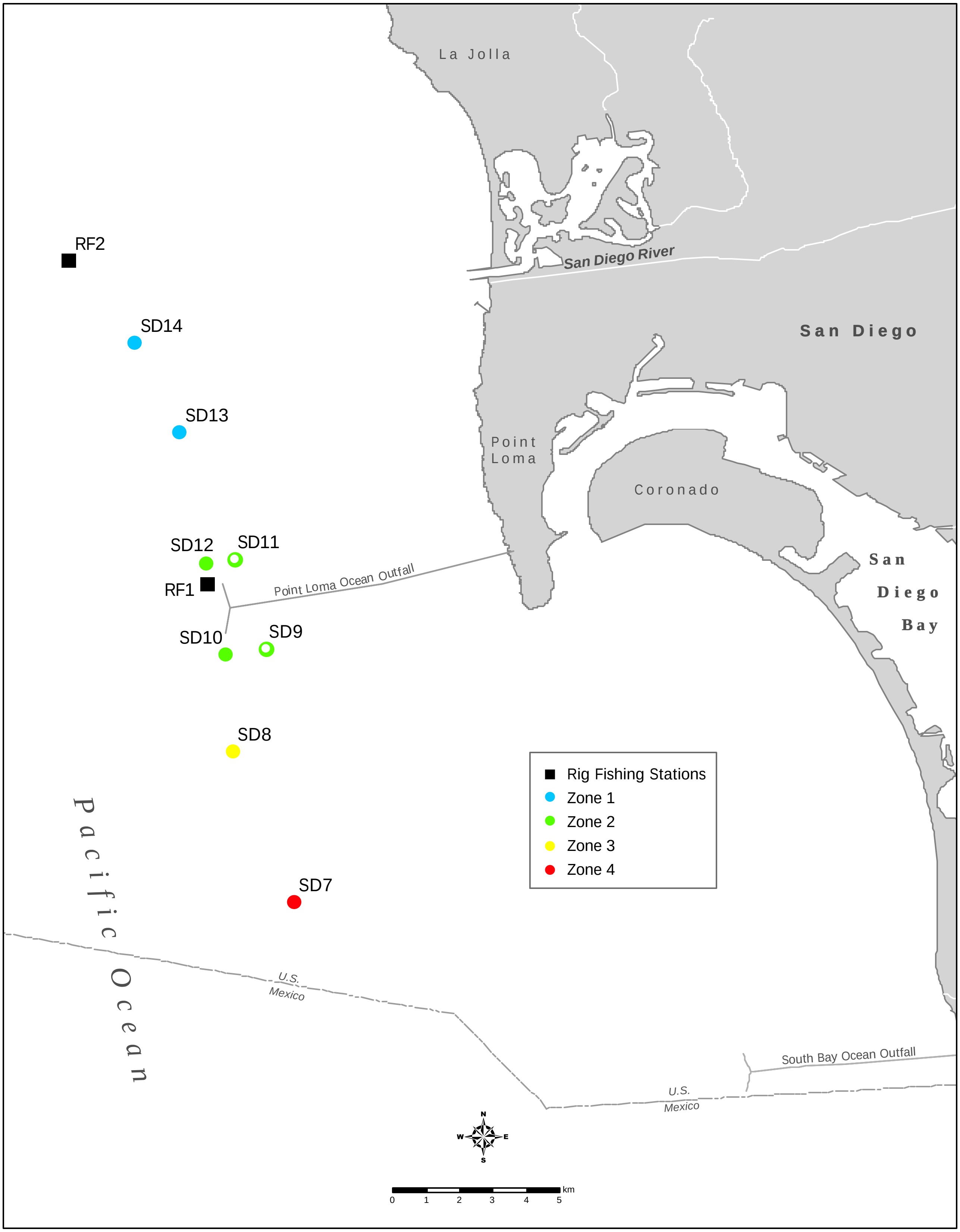


Figure 7.1
Otter trawl and rig fishing stations (by zone), Point Loma Ocean Outfall Monitoring Program.

Table 7.1

Stations, zones, and species sampled during April and October 2003. PS = Pacific sanddab; ES = English sole; CS = California scorpionfish; LS = longfin sanddab; HT = hornyhead turbot; VR = vermilion rockfish; CR = copper rockfish; MR = mixed rockfish; BC = bocaccio.

Station	Zone	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9
April 2003										
SD 7	Zone 4	PS	CS	CS						
SD8	Zone 3	CS	PS	PS						
SD9	Zone 1	LS	PS	LS						
SD10	Zone 1	CS	CS	CS						
SD11	Zone 1	LS	CS	CS						
SD12	Zone 1	PS	CS	CS						
SD13	Zone 2	CS	LS	PS						
SD14	Zone 2	PS	PS	CS						
RF1	Zone 1	VR	MR	VR						
RF2	Zone 2	MR	BC	MR						
October 2003										
SD7	Zone 4	PS	PS	PS	BS*	LS*				
SD8	Zone 3	PS	PS	PS						
SD10, SD12	Zone 1	ES	ES	ES	PS	PS	PS	HT	HT*	
SD13, SD14	Zone 2	LS	LS	LS	ES	ES	ES	PS	PS	PS
RF1	Zone 1	CR	MR	VR						
RF2	Zone 2	VR	VR	VR						

* Only PCBs, chlorinated pesticides and selenium analysed for these samples.

Biology Laboratory freezer. The stations included in each zone and the species that were analyzed from each station are summarized in **Table 7.1**.

Tissue Processing and Chemical Analyses

All dissections were performed according to standard techniques for tissue analysis (see City of San Diego 2004a). Each fish was partially defrosted and then cleaned with a paper towel to remove loose scales and excess mucus prior to dissection. The standard length (cm) and weight (g) of each fish were recorded (**Appendix D.1**). Dissections were carried out on Teflon pads that were cleaned between samples. Tissue samples were then placed in glass jars, sealed, labeled and stored in a freezer at -20°C prior to chemical analyses. All samples were subsequently delivered to the City of San Diego Wastewater Chemistry Laboratory within seven days of dissection.

All tissue samples were analyzed for the chemical constituents specified by the NPDES permit under which this sampling was performed, including various metals, chlorinated pesticides, PCBs, and PAHs (**Appendix D.2**). A summary of all parameters detected at each station during each survey is listed in **Appendix D.3**. Detected parameters include some that were determined to be present in a sample with high confidence (i.e., peaks are confirmed by mass-spectrometry), but at levels actually below the MDL. These were included in the data as estimated values. No PAHs were detected in fish tissues during 2004. A detailed description of the analytical protocols may be obtained from the City of San Diego Wastewater Chemistry Laboratory (City of San Diego 2004b).

A more sensitive Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) instrument used for the analysis of metals was introduced mid-year of 2003. The new instrument lowered method detection limits by approximately an order of magnitude. Consequently, low concentrations of metals that would not have been detected in the April samples were detected during the October survey.

RESULTS

Contaminants in Trawl-Caught Species

Metals

Aluminum, arsenic, cadmium, copper, iron, manganese, mercury, selenium, and zinc occurred frequently in the liver samples of all trawl-caught species of fish (**Table 7.2**). Each of these metals was detected in over 65% of the samples from both surveys, although in highly variable concentrations. For example, zinc occurred in all species with concentrations ranging from about 17 to 137 ppm. Barium, beryllium, chromium, nickel, silver, and tin were detected much more frequently in October than in April and at very low concentrations. The significant increase in detection rates is a result of the change in analytical instrumentation between surveys.

Comparisons of the frequently detected metals were made between the stations closest to the discharge site (Zone 1) and those farther away (Zones 2–4) using representatives of the sanddab feeding guild, longfin and Pacific sanddabs (see Allen et al. 2002) (**Figure 7.2**). Values varied substantially and there was no clear relationship between contaminant levels and proximity to the outfall.

Chlorinated Pesticides

Nine pesticides were detected in liver tissues from fishes collected in the Point Loma coastal region (**Table 7.3**). DDT was the most prevalent pesticide; it occurred in all samples with concentrations of total DDT ranging between 86 ppb and 3,346 ppb. These values were below the maximum values reported for this area prior to discharge (City of San Diego 1996). Chlordane, BHC, dieldrin, endrin, hexachlorobenzene (HCB), heptachlor, Mirex and nonachlor were also detected, although most at concentrations less than 100 ppb. Of these pesticides, chlordane, HCB and nonachlor were the most common, with detection rates greater than 65%.

The four most frequently detected pesticides were plotted by zone to address spatial patterns (**Figure 7.3**). DDT, chlordane, HCB, and nonachlor were detected in fishes collected from all four zones. As with the metals, there was no clear relationship between concentrations of these parameters and proximity to the outfall.

PCBs

Polychlorinated biphenyls (PCBs) occurred in all fish samples (Table 7.3 and Appendix D.3). Total PCB concentrations were variable and ranged from about 40 to 1103 ppb. No clear relationship was evident between concentrations of PCBs in fish liver samples and proximity to the outfall.

Contaminants in Rig-Caught Fish

Concentrations of contaminants in muscle tissue samples from rig-caught fishes were compared to national and international limits and standards to address human health concerns, both of which apply to the sale of seafood for human consumption (Mearns et al. 1991). In 2003, arsenic, chromium, copper, mercury, selenium, and zinc were detected in more than 50% of the fishes collected (**Table 7.4**). Of these, arsenic, mercury, and selenium had concentrations higher than their median international standards. In addition, the maximum detected value of mercury in vermilion rockfish exceeded the United States Food and Drug Administration (FDA) action limit for mercury. All values of total DDT were below the FDA action limit.

Spatial patterns were assessed for chlorinated pesticides and PCBs, as well as all metals that occurred frequently in fish muscle tissue samples (**Figure 7.4**). Although concentrations of these parameters were variable, samples from the nearfield station (RF1) had values generally similar to those of the farfield station (RF2). For example, fish from both sites had concentrations of arsenic, mercury, and selenium that exceeded the international standards. However, a

Table 7.2

Concentrations (ppm) of metals detected in liver samples from fish collected as part of the PLOO monitoring program during 2003; n = number of detected values.

	Al	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
Pacific sanddab																
n (out of 20)	20	20	12	11	19	14	20	20	1	19	13	12	20	11	12	20
Min	3.8	1.6	0.10	0.004	1.74	0.24	1.2	56	2.7	0.56	0.040	0.12	0.66	0.062	1.31	17
Max	13.5	4.6	0.18	0.009	7.40	0.52	16.5	101	2.7	1.28	0.107	0.30	1.48	0.095	90.50	29
Mean	8.4	2.7	0.13	0.005	3.98	0.35	6.5	77	2.7	0.86	0.068	0.20	0.99	0.078	9.02	24
California scorpionfish																
n (out of 12)	10	8	0	1	12	5	12	12	0	10	12	0	12	0	0	12
Min	3.8	1.5	—-	0.058	1.36	0.37	30.5	104	—-	0.28	0.039	—-	0.63	—-	—-	79
Max	17.3	3.6	—-	0.058	4.73	0.51	84.1	187	—-	0.73	0.222	—-	1.11	—-	—-	137
Mean	10.8	2.2	—-	0.058	2.72	0.44	46.0	136	—-	0.45	0.114	—-	0.85	—-	—-	104
Longfin sanddab																
n (out of 7)	5	7	3	3	7	4	7	7	0	7	6	3	7	3	3	7
Min	4.8	8.3	0.10	0.005	1.86	0.29	4.6	153	—-	0.66	0.044	0.17	2.57	0.176	1.24	20
Max	11.2	18.5	0.14	0.006	5.29	0.86	10.9	219	—-	1.84	0.165	0.18	3.88	0.269	1.58	32
Mean	7.5	11.2	0.11	0.005	2.92	0.45	7.5	185	—-	1.14	0.089	0.17	3.33	0.231	1.36	25
English sole																
n (out of 6)	6	6	6	6	6	6	6	6	2	6	5	6	6	6	6	6
Min	4.7	4.1	0.08	0.004	0.59	0.24	1.0	105	0.5	0.68	0.034	0.17	1.68	0.064	0.95	32
Max	8.3	7.9	0.11	0.005	0.77	0.28	12.3	143	0.88	1.31	0.078	0.19	3.01	0.319	1.29	80
Mean	6.0	6.0	0.10	0.004	0.69	0.25	5.0	127	0.69	0.94	0.060	0.18	2.48	0.192	1.07	56
Hornyhead turbot																
n (out of 1)	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1
Min	7.4	4.8	0.10	—-	5.07	0.27	5.7	109	—-	0.59	0.137	0.20	0.89	0.270	1.17	65
Max	7.4	4.8	0.10	—-	5.07	0.27	5.7	109	—-	0.59	0.137	0.20	0.89	0.270	1.17	65
Mean	7.4	4.8	0.10	—-	5.07	0.27	5.7	109	—-	0.59	0.137	0.20	0.89	0.270	1.17	65
ALL SPECIES																
% Detect. April	83	83	0	4	96	33	100	100	4	88	67	0	100	0	0	100
%Detect. Oct.	100	100	100	91	100	100	100	100	9	100	95	100	88	95	100	100

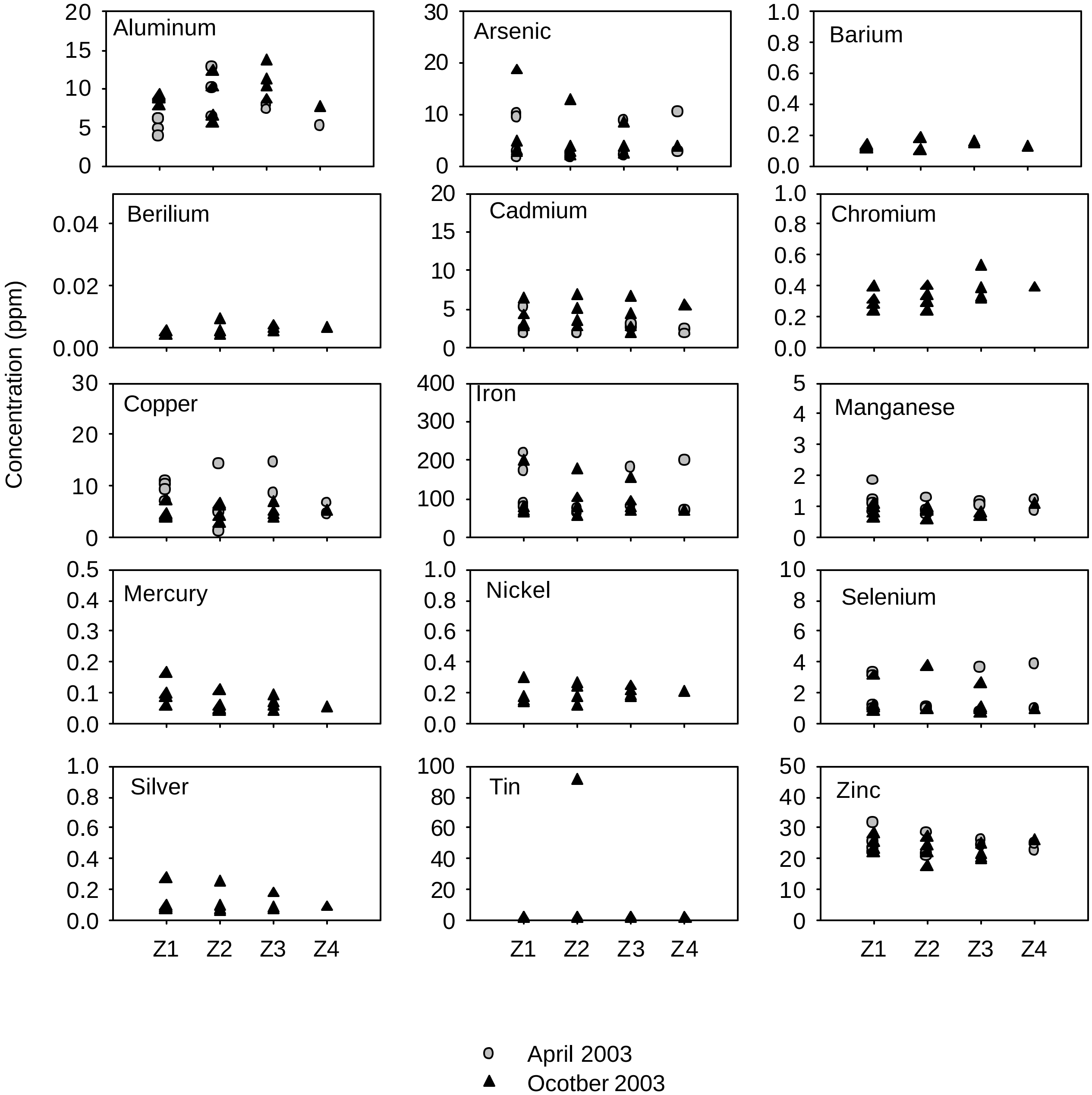


Figure 7.2
Concentrations of metals (ppm) detected frequently in liver tissues of fish collected as part of the PLOO monitoring program during 2003.

Table 7.3

Concentrations of chlorinated pesticides, PCBs, and lipids detected in liver samples from fish collected as part of the PLOO monitoring program during 2003. BHC = Lindane, HCB = hexachlorobenzene, Hept. = heptachlor. Values are expressed as parts per billion (ppb) for all parameters except lipids, which are presented as percent weight (% wt); n = number of detected values.

	Chlorinated Pesticides										
	Total Chlord.	Total BHC	Dieldrin	Endrin	HCB	Hept.	Mirex	Total Nonachlor	Total DDT	Total PCB	Lipids
Pacific sanddab											
n (out of 20)	19	3	1	2	20	0	0	19	20	20	20
Min	5.2	6.8	93	11	4.9	—-	—-	6.7	460.7	155.4	16.1
Max	52.0	61.0	93	90	10.0	—-	—-	16.0	898.6	1102.6	53.1
Mean	13.2	26.6	93	51	7.4	—-	—-	11.5	665.1	333.7	37.3
California scorpionfish											
n (out of 12)	6	1	1	1	6	1	0	12	12	12	12
Min	3.3	6.9	36	10	3.7	2.5	—-	6.7	402.5	217.2	16.5
Max	5.0	6.9	36	10	5.8	2.5	—-	16.4	3346.0	600.5	31.4
Mean	4.1	6.9	36	10	4.5	2.5	—-	11.3	1017.0	367.8	23.9
Longfin sanddab											
n (out of 8)	8	2	0	1	6	0	5	8	8	8	8
Min	6.7	25.0	—-	50	2.0	—-	1.7	6.8	494.7	398.5	14.7
Max	22.5	388.0	—-	50	7.5	—-	4	34.0	1762.5	1071.9	43.4
Mean	12.5	206.5	—-	50	5.0	—-	2.7	16.0	1115.8	750.5	25.4
English sole											
n (out of 6)	0	0	0	0	4	0	0	0	6	6	6
Min	—-	—-	—-	—-	1.5	—-	—-	—-	85.9	39.6	14.1
Max	—-	—-	—-	—-	2.7	—-	—-	—-	297.3	216.2	25.4
Mean	—-	—-	—-	—-	2.2	—-	—-	—-	179.58	123.8	19.4
Hornyhead turbot											
n (out of 2)	0	0	0	0	2	0	0	0	2	2	2
Min	—-	—-	—-	—-	1.7	—-	—-	—-	174.5	108.5	14.3
Max	—-	—-	—-	—-	2.0	—-	—-	—-	252.0	155.8	17.5
Mean	—-	—-	—-	—-	1.9	—-	—-	—-	213.3	132.2	15.9
Bigmouth sole											
n (out of 1)	0	0	0	0	1	0	0	0	1	1	1
Min	—-	—-	—-	—-	1.4	—-	—-	—-	88.0	80.6	8.6
Max	—-	—-	—-	—-	1.4	—-	—-	—-	88.0	80.6	8.6
Mean	—-	—-	—-	—-	1.4	—-	—-	—-	88.0	80.6	8.6
ALL SPECIES											
% Detected	67	12	4	8	80	2	10	80	100	100	100

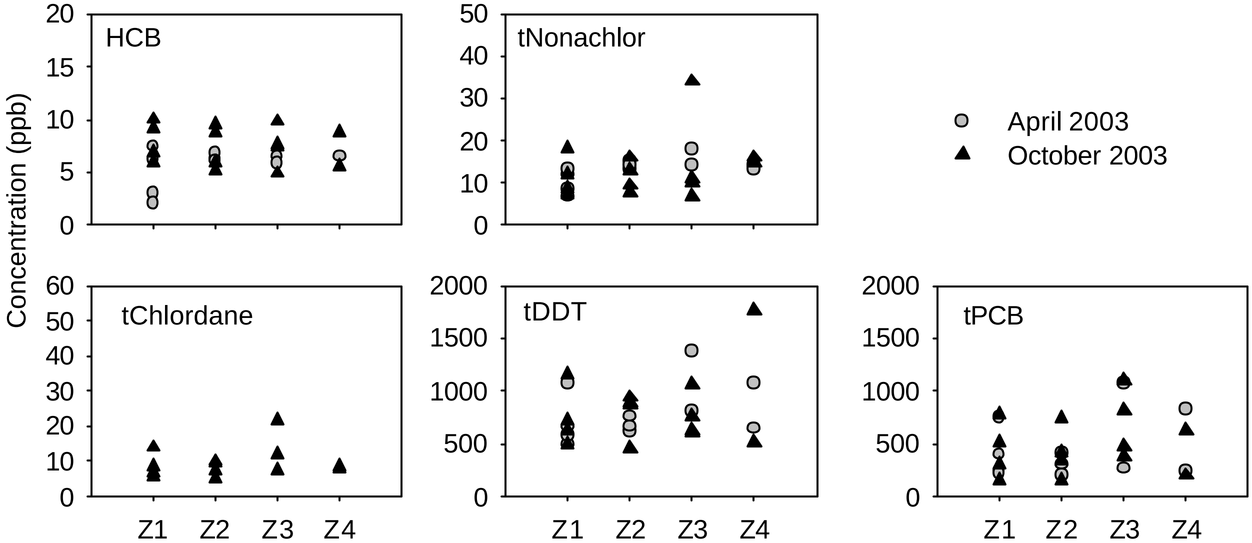


Figure 7.3
Concentrations of frequently detected chlorinated pesticides and total PCB detected in liver tissues of fish as part of the PLOO monitoring program during 2003.

single sample from RF1 had the highest concentration of several parameters (e.g., Cr, Cu, HCB, DDT, PCB), as well as the mercury value that exceeded the USFDA action limit.

SUMMARY and CONCLUSIONS

Demersal fish collected around the Point Loma Ocean Outfall in 2003 were characterized by contaminant values within the range of those reported previously for other Southern California Bight (SCB) fish assemblages (see Mearns et al. 1991, Allen et al. 1998, 2002). In addition, concentrations of these contaminants were generally similar to those reported previously by the City of San Diego (City of San Diego 1996–2003).

The frequent occurrence of metals and chlorinated hydrocarbons in PLOO fish tissues may be due to many factors. Mearns et al. (1991) described the distribution of several contaminants, including arsenic, mercury, DDT, and PCBs as being ubiquitous in the SCB. In fact, many metals (e.g., aluminum and iron) occur naturally in the environment, although little information is available on their background levels in fish tissues. Brown et al. (1986) determined that no areas of the SCB are sufficiently free of chemical contaminants to be considered reference sites. This has been supported by more recent work regarding PCBs and DDTs (e.g., Allen et al. 1998).

Other factors that affect the accumulation and distribution of contaminants include the physiology and life history of different fish species. For example, exposure to contaminants can vary greatly between different species and also among individuals of the same species depending on the migration habits of these fish (Otway 1991). Fish may be exposed to contaminants in one highly contaminated area and then move into an area that is less contaminated. This may explain why many of the metals, pesticides and PCBs detected in fish tissues during 2003 were rarely detected or not detected at all in the sediments immediately surrounding the PLOO (see Chapter 4). In addition, differences in feeding habits, age, reproductive status, and gender can affect the amount of contaminants a fish will retain (e.g., Connell 1987, Evans et al. 1993). These factors make comparisons of contaminants among species and between stations difficult.

Overall, there was no evidence that fishes collected in 2003 were contaminated by the discharge of waste water from the Point Loma Ocean Outfall. With one exception, concentrations of all mercury and DDT in muscle tissues from sport fish collected in the area were below FDA human consumption limits. Finally, there was no other indication of poor fish health in the region, such as the presence of fin rot or other physical anomalies (see Chapter 6).

Table 7.4

Concentrations (ppm) of various metals and total DDT detected in muscle samples from fish collected at PLOO rig fishing stations during 2003. Also included are USFDA action limits and median international standards. Bolded values exceed standards.

	As	Cd	Cr	Cu	Pb	Hg	Se	Sn	Zn	tDDT
Vermilion rockfish										
n (out of 6)	6	0	6	6	0	6	6	4	6	6
Min	**1.4**	—-	0.13	0.3	—-	0.06	0.28	0.47	3.4	0.003
Max	**2.6**	—-	0.37	8.6	—-	**1.25**	**0.55**	0.61	4.7	0.026
Mean	**1.9**	—-	0.23	2.0	—-	0.29	**0.38**	0.54	3.8	0.014
Mixed rockfish										
n (out of 4)	3	0	1	2	0	4	4	1	4	4
Min	**1.5**	—-	0.23	0.3	—-	0.19	0.29	0.49	2.8	0.006
Max	**3.1**	—-	0.23	1.0	—-	**0.58**	**0.39**	0.49	4.7	0.083
Mean	**2.6**	—-	0.23	0.7	—-	0.39	**0.35**	0.49	3.5	0.025
Copper rockfish										
n (out of 1)	1	0	1	1	0	1	1	1	1	1
Min	**2.8**	—-	0.17	0.2	—-	**0.79**	**0.60**	0.58	3.5	0.014
Max	**2.8**	—-	0.17	0.2	—-	**0.79**	**0.60**	0.58	3.5	0.014
Mean	**2.8**	—-	0.17	0.2	—-	**0.79**	**0.60**	0.58	3.5	0.014
Bocaccio										
n (out of 1)	0	0	0	1	0	1	1	0	1	1
Min	—-	—-	—-	1.8	—-	0.19	**0.30**	—-	3.2	0.007
Max	—-	—-	—-	1.8	—-	0.19	**0.30**	—-	3.2	0.007
Mean	—-	—-	—-	1.8	—-	0.19	**0.30**	—-	3.2	0.007
ALL SPECIES										
% Detected	83	0	67	83	0	100	100	50	100	100
US FDA Action Limit*						1				5
Median International Standard*	1.4	1.0	1.0	20.0	2.0	0.5	0.3	175.0	70.0	5.0

*From Table 2.3 in Mearns et al. 1991. USFDA action limit for total DDT is for fish muscle tissue, USFDA mercury action limits and all international standards are for shellfish, but are often applied to fish. All limits apply to the sale of seafood for human consumption.

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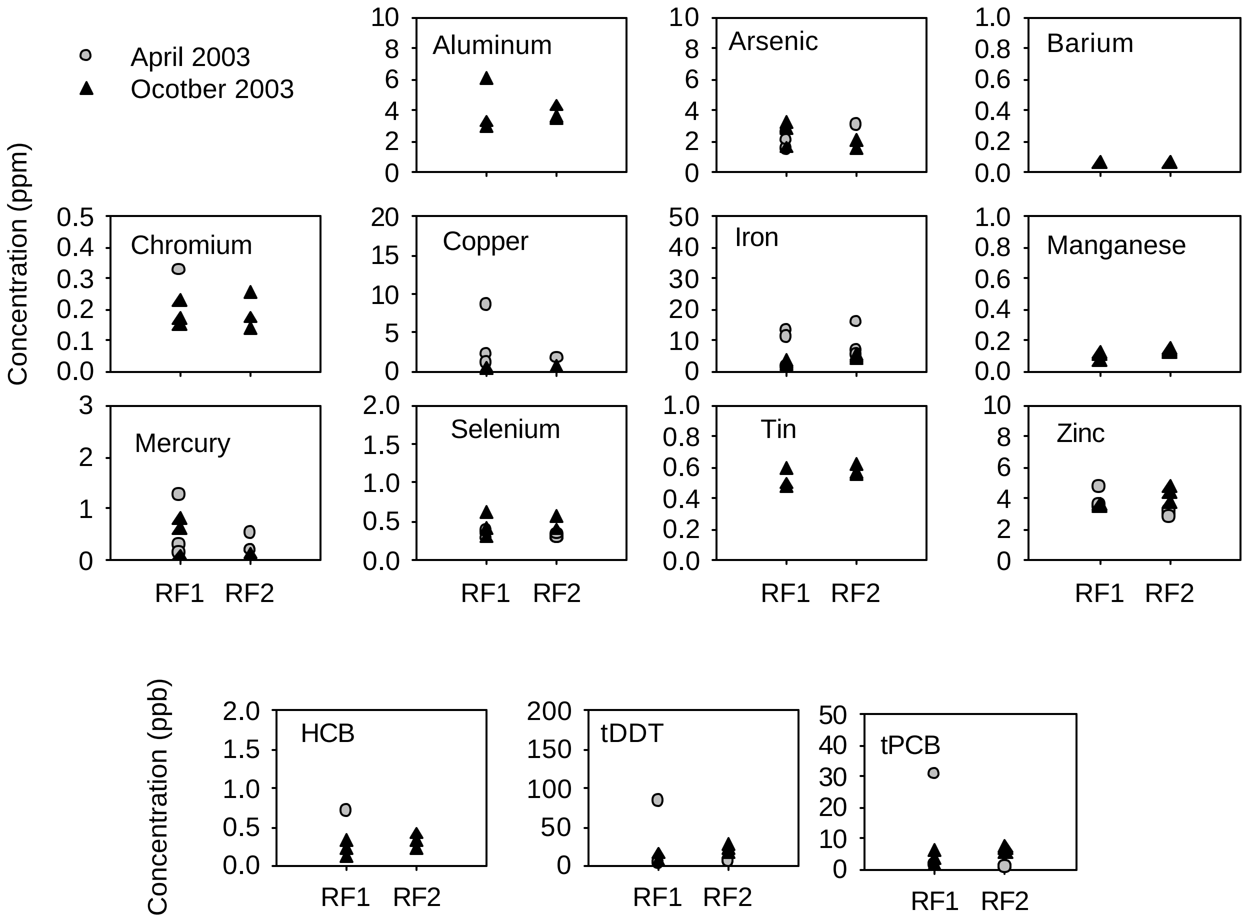

Figure 7.4

Concentrations of frequently detected metals (ppm), pesticides (ppb), and total PCB (ppb) in muscle tissues of fish collected at PLOO rig fishing stations during 2003.

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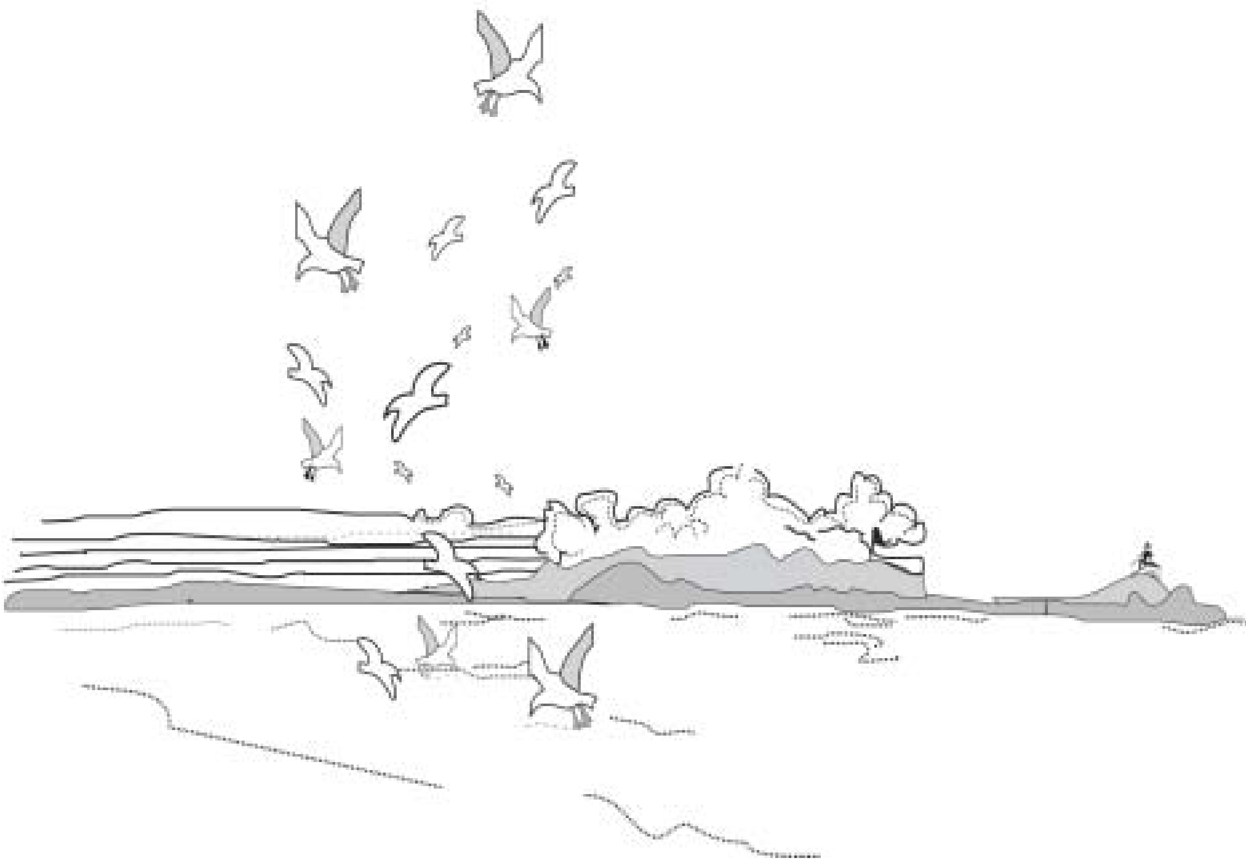
Glossary



Glossary

Absorption The movement of a dissolved substance (e.g., pollution) into cells by osmosis or diffusion.

Adsorption The accumulation of a dissolved substance on the sediment or on the surface of an organism (e.g., a flatfish).

Ambicoloration A term specific to flatfish that describes the presence of pigmentation on both the eyed and the blind sides. Normally in flatfish, only the eyed side is pigmented.

Anthropogenic Made and introduced into the environment by humans, especially pertaining to pollutants.

BACIP (Before-After-Control-Impact-Paired) An analytical tool for assessing environmental impacts. Samples are collected from control and impacted sites before and after wastewater is released. A statistical test is applied to distinguish change (e.g., in a population or organisms), accounting for variability, caused by the effects of pollution from natural variation over time and between sites.

Benthic Pertaining to the environment inhabited by organisms living on or in the ocean bottom.

Benthos Living organisms (e.g., algae and animals) associated with the sea bottom.

Bioaccumulation The concentration of a chemical in animal tissue that becomes accumulated over time by direct intake via contaminated water, the consumption of contaminated prey, or absorption through the skin.

BOD (Biochemical Oxygen Demand) The amount of oxygen consumed (through biological or chemical processes) during the decomposition of organic material contained in a water or sediment sample. It is a measure for certain types of organic pollution.

Biota The living organisms within a habitat or region.

BRI (Benthic Response Index) An index that measures levels of environmental disturbance by assessing the condition of a benthic assemblage. The index was based on organisms found in the soft sediments of the Southern California Bight.

CDF (cummulative distribution function) or 50% CDF Used herein to refer to the median value of a chemical parameter (e.g., concentrations of trace metals, organic indicators) occurring within throughout the Southern California Bight (SCB). These values are based upon results from the 1994 Southern California Bight Pilot Project (see http://www.sccwrp.org/regional/94scbpp/sedchem/sedchem_app.html). Fifty percent of the concentrations of a chemical parameter sampled in 1994 occurred at or below the 50% CDF.

CFU (colony-forming unit) A unit (measurement) of density used to estimate bacteria concentrations. It represents the number of bacterial cells that grow to form entire colonies, which can then be quantified visually.

Congeners Used herein in reference to any one of 209 different PCB compounds (see below). A congener may have between 1 and 10 chlorine atoms, which may be located at various positions on the PCB molecule.

Control site A geographic location that is far enough from a known pollution source (e.g., ocean outfall) to be considered representative of an undisturbed environment. Information collected within control sites is used as a reference and compared to impacted sites.

Crustacea A group (subphylum) of marine invertebrates characterized by jointed legs and an exoskeleton. Crabs, shrimps, and lobsters are examples.

CTD (conductivity, temperature, and depth) A device consisting of a group of sensors that continually measure various physical and chemical properties such as conductivity (a proxy for salinity), temperature, and pressure (a proxy for depth) as it is lowered through the water.

Demersal Refering to organisms living on or near the bottom of the ocean and capable of active swimming. For example, flatfish.

Dendrogram A treelike diagram used to represent hierarchal relationships from a multivariate analysis where results from several monitoring parameters are compared among sites.

Diversity (Shannon diversity index, H') A measurement of community structure that describes the abundances of different species within a community, taking into account their relative rarity or commonness.

Dominance (Swartz) A measurement of community structure that describes the minimum number of species accounting for 75% of the abundance in each grab

Echinodermata A group (phylum) of marine invertebrates characterized by the presence of spines, a radially symmetrical body, and tube feet. For example, seastars, sea urchins, and sea cucumbers.

Ectoparasite A parasite that lives on the outside of its host, and not within the host's body. Isopods and leeches attached to flatfish are examples.

Epibenthic Referring to organisms that live on or near the sediments or other substrates (e.g., rock). See demersal. Compare with infauna.

Epifauna Animals living on the surface of sea bottom sediments or other substrates (e.g., rock).

Impact site A geographic location that has been altered by the effects of a disturbance (e.g., pollution source or anthropogenic activity), such as a wastewater outfall.

Indicator Species Marine invertebrates whose presence in the community reflects the health of the environment. The loss of pollution-sensitive species or the introduction of pollution-tolerant species can indicate environmental disturbance or anthropogenic impact.

Infauna Animals living in the soft bottom sediments usually burrowing or building tubes within.

Invertebrate An animal without a backbone. For example, a seastar, crab, or worm.

ITI (Infaunal Trophic Index) An environmental disturbance index based on the feeding structure of marine soft-bottom benthic communities and the rationale that a change in sediment quality will restructure the invertebrate community to one best suited to feed in the altered sediment type. Generally, ITI values less than 60 indicate a pollution impacted benthic community.

Kurtosis A measure that describes the shape (i.e., peakedness or flatness) of distribution relative to a normal distribution (bell shape) curve. Kurtosis can indicate the range of a data set, and is used herein to describe the distribution of particle sizes within sediment grain size samples.

Macrobenthic invertebrate (Macrofauna) Epifaunal or infaunal benthic invertebrates that are visible with the naked eye. Larger than meiofauna and smaller than megafauna, this group typically includes those animals collected in grab samples from soft-bottom marine habitats and retained on a 1mm mesh screen.

MDL (method detection limit) The EPA defines MDL as "the minimum concentration that can be determined with 99% confidence that the true concentration is greater than zero."

Megabenthic invertebrate (Megafauna) A larger, usually epibenthic and motile, bottom-dwelling animal such as a sea urchin, crab, or snail. Typically collected by otter trawls with a minimum mesh size of 1cm.

Mollusca A taxonomic group (phylum) of invertebrates characterized as having a muscular foot, visceral mass, and a shell. Examples include snails, clams, and octopi.

Motile Self-propelled or actively moving.

Niskin Bottle A long plastic tube with caps open at both ends allowing water to pass through until the caps are triggered to close from the surface. They often are arrayed with several others in a rosette sampler to collect water at various depths.

NPDES (National Pollutant Discharge Elimination System) A federal permit program that controls water pollution by regulating point source discharge into waters of the United States.

Ophiuroidea A taxonomic group (class) of echinoderms that comprises the brittle stars. Brittle stars usually have five long, flexible arms and a central disk-shaped body.

PAHs (Polynuclear aromatic hydrocarbons) Hydrocarbon compounds with multiple benzene rings which are typical components of asphalts, fuels, oils, and greases. They are also refered to as polycyclic aromatic hydrocarbons. PAHs are potent carcinogens and mutagens.

PCBs (Polychlorinated biphenyls) A category, or family, of organic compounds that includes 209 synthetically halogenated aromatic hydrocarbons formed by the addition of chlorine (C_{12}) to biphenyl ($C_{12}H_{10}$). PCB are used in wide ranging industrial applications (e.g., insulation materials in electrical capacitors, hydrolic fluids, paint additives) and have been linked to reproductive and nervous system disorders and cancer in humans.

Phi (size) The conventional unit of sediment size based on the log of sediment grain diameter. The larger the Phi number, the smaller the grain size.

Plankton Animal and plant-like organisms, usually microscopic, that are passively carried by the ocean currents.

PLOO (Point Loma Ocean Outfall) The underwater pipe used to discharge treated wastewater originating from the Point Loma Wastewater Treatment Plant. It extends 7.2 km (4.5 miles) offshore and discharges into about 96 m (320 ft) of water.

Polychaeta A taxonomic group (class) of invertebrates characterized as having worm-like features, segments, and bristles or tiny hairs. Examples include bristle worms

Pycnocline A depth zone in the ocean where density increases rapidly with depth, in association with a decline in temperature and increase in salinity.

Recruitment In an open ocean environment, the retention of young individuals into the adult population.

Red relict sand Coarse reddish-brown sand that is a remnant of a pre-existing formation after other parts have disappeared. Typically originating from land and transported to the ocean bottom through erosional processes.

Rosette sampler A device consisting of a round metal frame housing a CTD in the center and multiple bottles (see Niskin bottle) arrayed about the perimeter. As the instrument is lowered through the water column, continuous measurements of various physical and chemical parameters are recorded by the CTD. The bottles are used to capture discrete water samples at desired depths.

Shell hash Fragments and remnants of bivalve and gastropod shells commonly found in marine sediments, and which frequently have the size and consistency of very coarse sand.

Skewness A measure of the lack of symmetry in a distribution or data set. Skewness can indicate where within a distribution most of the data lies. It is used herein to describe the distribution of particle sizes within sediment grain size samples.

Sorting The range of grain sizes comprising marine sediments, and may also refer to the process by which sediments of similar size are naturally segregated during transport and deposition according to the velocity and transporting medium. Well-sorted sediments are of similar size (such as desert sand), while poorly-sorted sediments have a wide range of grain sizes (as in a glacial till).

SBOO (South Bay Ocean Outfall) The underwater pipe used to discharge treated wastewater originating from the International Wastewater Treatment Plant. It extends 5.6 km (4.5 miles) offshore and discharges into about 27 m (90 ft) of water.

SCB (Southern California Bight) The geographic region that stretches from Point Conception, U.S.A. to the Cabo Colnett, Mexico, and encompasses nearly 80,000 km2 of coastal land and sea.

Species Richness The number of species per unit area, frequently used to assess community diversity.

Standard length The measurement of a fish from the most forward tip of the body to the base of the tail but excluding the tail fin rays. Fin rays can sometimes be eroded by pollution or preservation so a measurement that includes them (i.e., total length) is considered less reliable.

Thermocline The zone in a thermally stratified body of water that separates warmer surface water from colder deep water. At a thermocline, temperature decreases rapidly over a short depth.

Transmissivity A measure of water clarity based upon the ability of water to transmit light along a straight path. Light that is scattered or absorbed by particulates (e.g., plankton, suspended solid materials) decreases the transmissivity (or clarity) of the water.

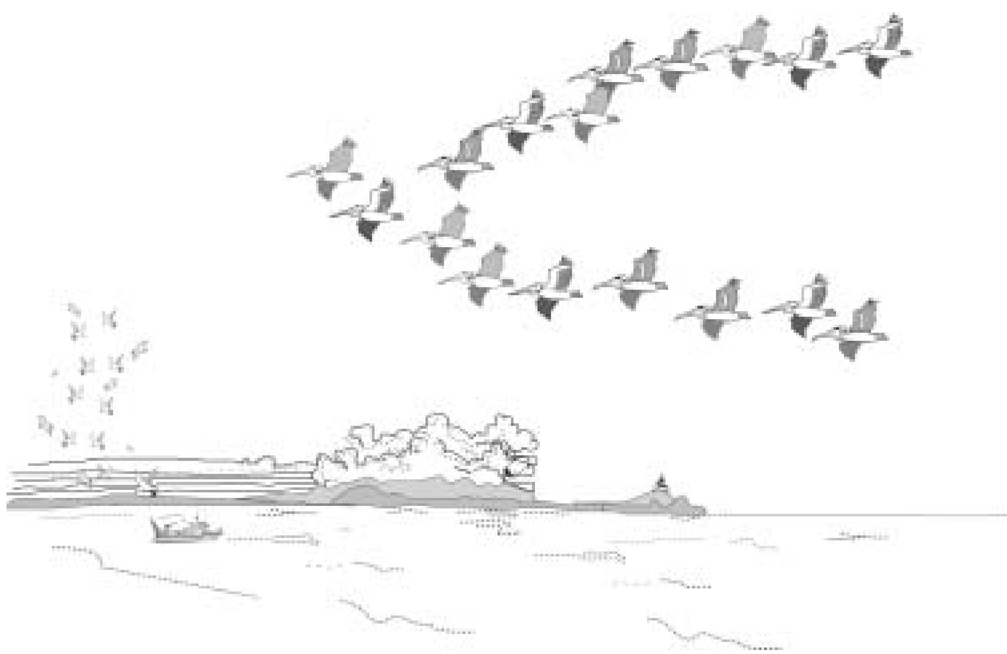
Upwelling The movement of nutrient-rich, and typically cold, water from the depths of the ocean to the surface waters along the coastline.

Van Dorn bottle A water-sampling device made of a plastic tube open at both ends that allows water to flow through. Rubber caps at the tube ends can be triggered to close underwater to collect water at a specified depth.

Van Veen Grab A mechanical device designed to collect bottom sediment samples with a surface area of 0.1 m^2. The device consists of a pair of hinged jaws and a release mechanism that allows the opened jaws to close and entrap a sediment sample once they touch bottom.

ZID (zone of initial dilution) The region of initial mixing of treated wastewater from the diffuser ports of the outfall with the surrounding receiving waters. The area with the ZID, including the underlying seabed, is chronically exposed to pollutants and is likely to be the area of greatest impact.

Appendices



APPENDIX A

Modifications to the Point Loma Ocean Outfall Monitoring and Reporting Program (Addendum No. 1, Order/MRP No. R9-2002-0025, NPDES Permit No. CA0107409)

Appendix A

Summary of Modifications to the Monitoring and Reporting Program (MRP) for the City of San Diego Point Loma Metropolitan Wastewater Treatment Plant Discharge to the Pacific Ocean through the Point Loma Ocean Outfall (Addendum No. 1, Order/MRP No. R9-2002-0025, NPDES Permit No. CA0107409)

Background

In originally proposing changes to City of San Diego's Ocean Monitoring Program for the Point Loma Wastewater Treatment Plant (NPDES Permit. No. CA0107409, Order No. R9-2002-0025), the City of San Diego (City), the San Diego Regional Water Quality Control Board (RWQCB), and the United States Environmental Protection Agency (USEPA) accounted for work done in developing the Model Monitoring Program (MMP) for large ocean discharges in southern California (Schiff et al. 2001). Consideration was also given to the fact that the City has a 301-h waiver from secondary wastewater treatment and how that affects some of the assumptions brought forward in the MMP. The question driven model was applied (see Chapter 1, Box 1.1) to program revisions. Considerations were given to the key questions that the various program components should address, including some short-term strategic studies to address specific questions about the discharge of wastewater via the Point Loma Ocean Outfall.

Consistent with the MMP design, the proposed new monitoring program includes three main components:

- Core monitoring
- Regional monitoring
- Special studies

The core monitoring component represents mostly modifications to the previous program that was approved and adopted in 2002 by the RWQCB and the USEPA. These changes were designed to address specific questions and to allow for the reallocation of resources for special adaptive studies and regional monitoring activities. The core program includes the following main elements:

- Microbiology and water quality (shore, kelp beds, offshore)
- Ocean sediments and benthic macrofaunal communities
- Bottom dwelling fish and invertebrate communities (trawls)
- Bioaccumulation of contaminants in trawl-caught fishes
- Sea food safety (rig fishing)
- Participation in regional aerial kelp forest surveys

The regional monitoring element represents a commitment to participate in the large scale, bight-wide surveys off southern California that are conducted on a 4-5 year basis. These have included the Southern California Bight Pilot Project (SCBPP) in 1994, the Southern California Bight 1998 Regional Monitoring Project (Bight'98), and the currently ongoing Southern California Bight 2003 Regional Monitoring Project (Bight'03).

Special studies represent an adaptive component intended to address specific questions that can be addressed by either short-term or long-term projects. An example would be the current remote sensing project that is jointly funded by the RWQCB, the City, and the International Boundary and Water

Commission (IBWC). This component is to be reviewed annually to determine the specific projects to be funded. Such a review will include input from the City, RWQCB, USEPA, interested environmental groups, and other interested parties. Examples of projects for the past year (Year 1) include a comprehensive scientific review of the Point Loma ocean monitoring program, the design of a sediment mapping study for the region, and continued participation in a remote sensing project for the entire San Diego coast.

The following is a summary of the general modifications made to the core monitoring component of the Point Loma permit. The details of the new permit are available online from the RWQCB (http://www.swrcb.ca.gov/rwqcb9/orders/order_files/r9-2002-0025.pdf).

Shoreline Water Quality

- Number and location of shoreline monitoring stations modified as follows:
  - Sampling added at three new sites located to the north near Ocean Beach Pier, Dog Beach, and Mission Beach (i.e., stations D10, D11, D12)
  - Sampling discontinued at three southernmost sites (i.e., stations D1, D2, D3); however, sampling at these locations will continue as part of South Bay Ocean Outfall monitoring programs (i.e., stations S8, S9, S12) for the South Bay Water Reclamation Plant (NPDES No. CA0109045) and the International Wastewater Treatment Plant (NPDES Permit No. CA0108928)
  - Sampling discontinued at station D6 located north of the Point Loma Ocean Outfall due to inaccessibility and lack of public use
- Sampling frequency increased to weekly all year long (vs. weekly from May through October and biweekly from November through April in previous permit)

Kelp Bed Water Quality

- Frequency of general water column sampling (i.e., CTD profiles of oceanographic parameters) increased from once per month to five times per month.

Offshore Water Quality

- Number and location of monitoring stations modified as follows:
  - Number of stations increased from 19 to 36
  - Sampling initiated at 36 stations comprising new offshore grid
  - Sampling discontinued at 19 stations comprising old offshore grid
- Sampling frequency modified from monthly to quarterly schedule (i.e., January, April, July, October)
- Secchi disk measurements discontinued
- Collection and analysis of total suspended solids (TSS) discontinued
- Microbiological assessment limited to Enteroccous only; however, the City voluntarily continues assessment of total and fecal coliform microbiological indicators as well

Benthic Sediments and Macrofaunal Communities

- Benthic sampling modified as follows:
    - Total number of benthic stations reduced from 23 to 22 (i.e., station B13 dropped)
    - Add sampling of macrofaunal community at two stations that were previously sampled for sediment grain size and chemistry only (i.e., stations E1 and E3)
- Benthic sample grid subdivided into primary and secondary core stations to accommodate regional monitoring and/or special studies
    - Primary core stations comprise the 12 sites located along the 98-m outfall depth contour; primary core sites typically retained during regional surveys or other special projects
    - Secondary core stations comprise 10 sites located along the 88-m and 116-m depth contours; requirements for sampling secondary core sites may be relaxed to allow participation in bight-wide regional monitoring efforts (e.g., Bight2 03) or other special projects upon approval of the Executive Officer of the RWQCB
- Sampling frequency modified from quarterly to semiannual schedule (January, July)

Demersal Fish & Invertebrate Communities (Trawling)

- Number of monitoring stations reduced from 11 to 6
    - Sampling discontinued at three “inshore” stations (i.e., SD1, SD3, SD6)
    - Sampling discontinued at two “outfall” stations (i.e,. SD9 and SD11)
- Sampling frequency modified from quarterly to semiannual schedule (January, July)
- Collection and analysis of invertebrate biomass data discontinued

Fish Tissue Contamination (Bioaccumulation in Trawl-Caught Fish)

- Number of monitoring stations reduced from 11 to 6 (see above)
- Six stations divided into four zones from which tissue samples may be collected
- Only liver tissue samples processed and analyzed (previously muscle and liver tissue)

Local Seafood Safety (Bioaccumulation in Fish Caught by Rig Fishing)

- Sampling frequency modified from semiannual to annual schedule (October)
- Only muscle tissue samples processed and analyzed (previously muscle and liver tissue)

LITERATURE CITED

Schiff, Kenneth, J. Brown, and S. Weisberg. (2001). Model Monitoring Program for Large Ocean Discharges in Southern California. Technical Report No. 357. California Coastal Water Research Project, Westminster, CA.

APPENDIX B

2003 PLOO Stations

Sediment Characteristics

“Supplemental Data”

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Appendix B.1

Sediment chemistry constituents analyzed for Point Loma Ocean Outfall sampling during 2003.

Cholorinated Pesticides				
Aldrin	BHC, Delta isomer	Endrin Aldehyde	Mirex	p,p-DDE
Alpha (cis) Chlordane	BHC, Gamma isomer	Gamma (trans) Chlordane	o,p-DDD	p,p-DDT
Alpha Endosulfan	Cis_Nonachlor	Heptachlor	o,p-DDE	Trans Nonachlor
Beta Enddosulfan	Dieldrin	Heptachlor epoxide	o,p-DDT	
BHC, Alpha isomer	Endosulfan sulfate	Hexachlorobenzene	Oxychlordane	
BHC, Beta isomer	Endrin	Methoxychlor	p,p-DDD	

Polycylic Aromatic Hydrocarbons			
1-methylnaphthalene	Acenaphthene	Benzo[G,H,I]perylene	Fluorene
1-methylphenanthrene	Acenaphthylene	Benzo[K]fluoranthene	Indeno(1,2,3-CD)pyrene
2,3,5-trimethylnaphthalene	Anthracene	Biphenyl	Naphthalene
2,6-dimethylnaphthalene	Benzo[A]anthracene	Chrysene	Perylene
2-methylnaphthalene	Benzo[A]pyrene	Dibenzo(A,H)anthracene	Phenanthrene
3,4-benzo(B)fluoranthene	Benzo[e]pyrene	Fluoranthene	Pyrene

Metals			
Aluminum (Al)	Cadmium (Cd)	Manganese (Mn)	Silver (Ag)
Antimony (Sb)	Chromium (Cr)	Mercury (Hg)	Thallium (Tl)
Arsenic (As)	Copper (Cu)	Nickel (Ni)	Tin (Sn)
Barium (Ba)	Iron (Fe)	Selenium (Se)	Zinc (Zn)
Beryllium (Be)	Lead (Pb)		

PCB Congeners			
PCB 18	PCB 81	PCB 126	PCB 169
PCB 28	PCB 87	PCB 128	PCB 170
PCB 37	PCB 99	PCB 138	PCB 177
PCB 44	PCB 101	PCB 149	PCB 180
PCB 49	PCB 105	PCB 151	PCB 183
PCB 52	PCB 110	PCB 153/168	PCB 187
PCB 66	PCB 114	PCB 156	PCB 189
PCB 70	PCB 118	PCB 157	PCB 194
PCB 74	PCB 119	PCB 158	PCB 201
PCB 77	PCB 123	PCB 167	PCB 206

Appendix B.2

Particle size statistics for PLOO sediments, January 2003 survey.

Station	Depth (m)	Mean Phi	Mean mm	SD Phi	Median Phi	Skewness Phi	Kurtosis Phi	Coarse %	Sand %	Silt %	Clay %	Sediment Observations
North Reference Stations												
B11	88	4.4	0.047	2.0	4.1	0.2	0.8	2.1	46.8	45.2	5.9	sand, clay, mud balls, shell hash
B8	88	4.6	0.041	1.6	4.2	0.4	0.9	0.0	43.0	53.5	3.5	silt, clay
B12	98	3.9	0.067	1.9	3.3	0.4	1.0	0.4	64.4	31.3	3.8	silt, sand, shell hash
B9	98	4.2	0.054	1.6	3.7	0.5	1.1	0.0	58.0	38.2	3.8	silt, sand, mud balls
B13	116	4.0	0.063	2.2	3.4	0.4	0.8	0.7	58.9	35.3	5.2	fine sand, shell hash
B10	116	4.1	0.058	1.8	3.4	0.5	0.9	0.1	64.2	31.2	4.4	sandy silt, shell hash
Stations North of the Outfall												
E19	88	4.4	0.047	1.4	4.0	0.5	1.2	0.0	51.7	44.9	3.4	silt
E20	98	4.0	0.063	1.4	3.6	0.5	1.3	0.0	64.0	33.0	3.0	silt
E23	98	4.1	0.058	1.5	3.7	0.4	1.3	0.0	60.9	36.1	3.0	silt
E25	98	4.2	0.054	1.5	3.7	0.5	1.1	0.0	59.5	37.4	3.1	silt, shell hash
E26	98	4.3	0.051	1.5	3.8	0.4	1.1	0.0	56.2	40.4	3.4	silt, clay
E21	116	4.1	0.058	1.5	3.5	0.5	1.2	0.0	64.0	32.8	3.3	silt
Outfall Stations												
E11	98	3.8	0.072	1.3	3.5	0.5	1.4	0.0	68.8	28.7	2.5	silt, shell hash
E14	98	3.9	0.067	1.5	3.5	0.5	1.4	0.5	68.3	28.8	2.4	silt, coarse black sand, gravel, shell hash
E17	98	4.0	0.063	1.4	3.6	0.4	1.3	0.0	66.7	30.1	2.7	silt, shell hash
E15	116	4.1	0.058	1.6	3.6	0.5	1.2	0.6	63.9	31.9	3.6	silt, sand, coarse black sand, shell hash
Stations South of the Outfall												
E1	88	4.1	0.058	2.2	3.7	0.3	1.0	2.3	53.5	37.1	4.3	
E7	88	4.3	0.051	1.5	3.8	0.5	1.1	0.0	55.3	41.5	3.1	silt
E2	98	4.2	0.054	1.9	3.8	0.3	0.9	1.2	53.4	41.0	3.4	silt, coarse sand, shell hash
E5	98	3.9	0.067	1.5	3.5	0.5	1.3	0.0	66.5	30.8	2.7	silt
E8	98	3.8	0.072	1.4	3.4	0.5	1.4	0.0	69.3	28.3	2.4	silt, coarse black sand
E3	116	4.1	0.058	2.6	3.6	0.1	1.0	6.4	47.5	40.5	5.5	
E9	116	4.3	0.051	1.8	3.8	0.4	1.1	2.0	54.8	38.3	4.9	silt, coarse black sand, shell hash

Appendix B.2 *continued.*

Particle size statistics for PLOO sediments, April 2003 survey.

Station	Depth (m)	Mean Phi	Mean mm	SD Phi	Median Phi	Skewness Phi	Kurtosis Phi	Coarse %	Sand %	Silt %	Clay %	Sediment Observations
North Reference Stations												
B11	88	4.8	0.036	2.0	4.7	0.1	0.9	1.9	36.2	55.9	6.0	sandy silt, coarse sand, shell hash
B8	88	4.5	0.044	1.5	4.2	0.3	1.1	0.0	45.6	50.7	3.2	silt, clay
B12	98	3.5	0.088	2.1	2.9	0.4	1.1	2.8	68.1	26.6	2.5	silty sand, coarse sand, shell hash
B9	98	4.2	0.054	1.6	3.7	0.5	1.0	0.0	59.1	37.8	3.1	silt, clay, pea gravel (mud)
B13	116	3.1	0.117	2.3	2.5	0.4	1.2	2.6	72.6	22.0	2.7	silty sand, coarse sand, shell hash
B10	116	3.9	0.067	1.6	3.3	0.5	1.2	0.0	70.4	27.0	2.6	silt, shell hash
Stations North of the Outfall												
E19	88	4.3	0.051	1.5	3.9	0.4	1.1	0.0	53.5	43.4	3.1	silt
E20	98	4.0	0.063	1.4	3.7	0.4	1.2	0.0	63.4	33.9	2.7	silt, shell hash, sulfur odor
E23	98	4.2	0.054	1.5	3.8	0.4	1.1	0.0	59.3	37.8	2.9	silt, shell hash
E25	98	4.1	0.058	1.5	3.7	0.5	1.2	0.0	60.1	36.7	3.2	silt, shell hash
E26	98	4.3	0.051	1.6	3.8	0.4	1.0	0.0	55.5	41.4	3.2	silt, shell hash
E21	116	4.1	0.058	1.5	3.6	0.5	1.2	0.0	65.2	31.9	2.8	silt
Outfall Stations												
E11	98	3.9	0.067	1.4	3.5	0.5	1.3	0.0	67.4	30.4	2.3	sandy silt, shell hash
E14	98	3.7	0.077	2.1	3.4	0.1	1.9	11.7	57.4	28.4	2.5	silt, coarse black sand, shell hash, gravel
E17	98	3.9	0.067	1.4	3.6	0.4	1.2	0.3	66.3	31.1	2.4	silt, shell hash
E15	116	3.9	0.067	1.5	3.5	0.5	1.3	0.1	68.6	28.5	2.8	silt, coarse black sand, shell hash
Stations South of the Outfall												
E1	88	4.1	0.058	1.8	3.6	0.4	0.9	0.3	57.4	39.2	3.1	
E7	88	4.3	0.051	1.5	3.8	0.4	1.1	0.0	55.6	41.8	2.6	sandy silt
E2	98	4.1	0.058	1.9	3.6	0.4	0.8	0.0	57.3	39.3	3.4	sandy silt, coarse sand, shell hash
E5	98	4.0	0.063	1.5	3.5	0.5	1.2	0.0	63.9	33.5	2.6	sandy silt
E8	98	3.9	0.067	1.4	3.5	0.5	1.3	0.0	67.2	30.4	2.4	sandy silt, shell hash
E3	116	3.8	0.072	2.1	3.1	0.5	0.9	3.1	59.3	33.6	4.1	
E9	116	4.3	0.051	1.9	3.6	0.4	1.1	1.6	56.5	38.1	3.9	silt, coarse sand, coarse black sand, shell hash

Appendix B.2 *continued.*

Particle size statistics for PLOO core station sediments, July 2003 survey.

Station	Depth (m)	Mean Phi	Mean mm	SD Phi	Median Phi	Skewness Phi	Kurtosis Phi	Coarse %	Sand %	Silt %	Clay %	Sediment Observations
North Reference Stations												
B12	98	3.1	0.117	2.2	2.8	0.2	1.2	2.2	70.8	24.4	2.5	sand, coarse sand, shell hash, rock
B9	98	4.1	0.058	1.7	3.6	0.4	1.1	0.0	59.7	37.1	3.2	silty sand, pea gravel (mud)
Stations North of the Outfall												
E20	98	4.1	0.058	1.5	3.7	0.4	1.2	0.0	60.4	36.8	2.8	silt, shell hash, tubes
E23	98	4.1	0.058	1.6	3.7	0.4	1.1	0.1	60.0	36.7	3.2	silt, coarse sand, shell hash
E25	98	4.0	0.063	1.6	3.7	0.4	1.2	0.1	62.3	34.7	2.9	silt, shell hash
E26	98	4.3	0.051	1.6	3.8	0.4	1.2	0.0	56.2	39.3	2.5	silt, shell hash
Outfall Stations												
E11	98	3.7	0.077	1.4	3.5	0.4	1.4	0.1	70.6	27.2	2.1	silt, coarse black sand, shell hash
E14	98	3.8	0.072	1.4	3.5	0.4	1.4	0.9	69.9	26.7	2.4	silt, coarse black sand, shell hash, gravel
E17	98	3.8	0.072	1.3	3.4	0.5	1.4	0.0	68.9	28.9	2.2	silt, shell hash
Stations South of the Outfall												
E2	98	4.2	0.054	2.0	3.8	0.2	1.0	3.5	50.5	41.3	3.7	coarse sand, silt, shell hash, rocks
E5	98	3.9	0.067	1.5	3.4	0.5	1.3	0.0	66.4	31.0	2.7	silt, coarse sand, shell hash
E8	98	3.8	0.072	1.4	3.5	0.4	1.3	0.3	68.6	28.9	2.2	silt, coarse black sand, shell hash

Appendix B.3

Summary of annual mean concentrations of PAHs (ppb) for PLOO monitoring stations during 2003. MDL = method detection limit. ERL TV = Effects Range Low Threshold. Area Mean = area mean for 2003. Undetected values are indicated by “nd@. Core stations are indicated in bold type.

SITE	N	2,6-DIMETHYLNAPHTHALENE	3,4-BENZO(B)FLUORANTHENE	ANTHRACENE	BENZO[A]ANTHRACENE
E1	2	nd	nd	nd	24.1
E2	3	nd	40.2	5.3	20.4
E3	2	nd	28	nd	15.5
E5	3	nd	nd	nd	nd
E8	3	nd	nd	nd	nd
E9	2	nd	16.6	nd	nd
E11	3	nd	18.2	nd	11.1
E14	3	10.3	nd	nd	nd
E17	3	8.3	nd	nd	nd
E20	3	nd	nd	nd	nd
E23	3	nd	nd	nd	nd
E25	3	nd	nd	nd	nd
E26	3	nd	nd	nd	nd
MDL		21	25	16	18

SITE	N	BENZO[A]PYRENE	BENZO[e]PYRENE	BENZO[G,H,I]PERYLENE	BENZO[K]FLUORANTHENE
E1	2	9.8	9	nd	nd
E2	3	24.9	17.3	9.6	9.7
E3	2	18.8	17.1	18.2	nd
E5	3	nd	nd	nd	nd
E8	3	nd	nd	nd	nd
E9	2	nd	nd	nd	nd
E11	3	12	9.8	nd	nd
E14	3	nd	nd	nd	nd
E17	3	nd	nd	nd	nd
E20	3	nd	nd	nd	nd
E23	3	nd	nd	nd	nd
E25	3	nd	nd	nd	nd
E26	3	nd	nd	nd	nd
MDL		21	18	10	18

Appendix B.3 *continued.*

Summary of annual mean concentrations of PAHs (ppb) for PLOO monitoring stations during 2003. MDL = method detection limit. ERL TV = Effects Range Low Threshold. Area Mean = area mean for 2003. Undetected values are indicated by “nd@. Core stations are indicated in bold type.

SITE	N	CHRYSENE	FLUORANTHENE	INDENO(1,2,3-CD)PYRENE	NAPHTHALENE
E1	2	nd	nd	nd	nd
E2	3	17.6	6.8	nd	5.3
E3	2	nd	nd	16.2	21.1
E5	3	nd	nd	nd	5.3
E8	3	nd	nd	nd	5.8
E9	2	nd	nd	nd	nd
E11	3	10.2	nd	nd	nd
E14	3	nd	nd	nd	5.6
E17	3	nd	nd	nd	nd
E20	3	4.3	nd	nd	6.4
E23	3	nd	nd	nd	6.9
E25	3	nd	nd	nd	5.9
E26	3	nd	nd	nd	7.2
MDL		12	12	14	16

SITE	N	PYRENE	TOTAL PAH
E1	2	13.5	56.3
E2	3	19.1	176.2
E3	2	32.8	167.6
E5	3	nd	12.3
E8	3	nd	5.8
E9	2	nd	16.6
E11	3	nd	61.4
E14	3	nd	15.9
E17	3	nd	8.3
E20	3	nd	10.7
E23	3	nd	6.9
E25	3	nd	5.9
E26	3	nd	7.2
MDL		17	

ERL TV = 4022

Average PAH for the Area = 42

APPENDIX C

2003 PLOO Stations

Demersal Fishes and Megabenthic Invertebrates

"Supplemental Data"

Appendix C.1

Demersal fish abundance and biomass and megabenthic invertebrate abundance for inshore stations SD1, SD3 and SD6 from January 2003 survey.

NAME	SD1	SD3	SD6	SPECIES ABUNDANCE BY SURVEY
LONGFIN SANDDAB	55	31	35	121
PACIFIC SANDDAB	51	41	22	114
YELLOWCHIN SCULPIN	2	9	33	44
PINK SEAPERCH	9	20	13	42
CALIFORNIA TONGUEFISH	3	11	11	25
ROUGHBACK SCULPIN	5	12	7	24
PLAINFIN MIDSHIPMAN		9	4	13
LONGSPINE COMBFISH	8	3	1	12
SHINER PERCH	11			11
HORNYHEAD TURBOT	2	1	4	7
CALIFORNIA SCORPIONFISH	2	2	2	6
CALIFORNIA LIZARDFISH	1	2	2	5
BAY GOBY		2	2	4
BIGMOUTH SOLE	2	1	1	4
ENGLISH SOLE	3			3
PYGMY POACHER		2	1	3
GREENBLOTCHED ROCKFISH	1			1
QUARTER	155	146	138	439

NAME	SD1	SD3	SD6	BIOMASS BY SPECIES
LONGFIN SANDDAB	1.5	0.8	0.4	2.7
CALIFORNIA SCORPIONFISH	0.4	0.4	0.4	1.2
PACIFIC SANDDAB	0.6	0.3	0.1	1.0
HORNYHEAD TURBOT	0.3	0.1	0.3	0.7
PINK SEAPERCH	0.2	0.2	0.3	0.7
CALIFORNIA TONGUEFISH	0.1	0.2	0.4	0.7
ROUGHBACK SCULPIN	0.1	0.2	0.3	0.6
BIGMOUTH SOLE	0.4	0.1	0.1	0.6
ENGLISH SOLE	0.4			0.4
LONGSPINE COMBFISH	0.2	0.1	0.1	0.4
YELLOWCHIN SCULPIN	0.1	0.1	0.2	0.4
SHINER PERCH	0.3			0.3
CALIFORNIA LIZARDFISH	0.1	0.1	0.1	0.3
BAY GOBY		0.1	0.1	0.2
PLAINFIN MIDSHIPMAN		0.1	0.1	0.2
PYGMY POACHER		0.1	0.1	0.2
GREENBLOTCHED ROCKFISH	0.1			0.1
QUARTER	4.8	2.9	3.0	10.7

NAME	SD1	SD3	SD6	SPECIES ABUNDANCE BY SURVEY
OPHIOTHRIX SPICULATA	7	11		18
ASTROPECTEN VERRILLI	13	1		14
CRANGON NIGROMACULATA	5	7		12
HEPTACARPUS STIMPSONI	8			8
HEPTACARPUS PALPATOR	2	4		6
LYTECHINUS PICTUS	6			6
SPIRONTOCARIS PRIONOTA	3			3
STYLATULA ELONGATA			3	3
THESEA SP B			3	3
CRANGON ALASKENSIS			2	2
HEMISQUILLA ENSIGERA CALIFORNIENSIS	1	1		2
OCTOPUS RUBESCENS	1		1	2
ASCIDIACEA	1			1
CALLIOSTOMA TURBINUM			1	1
HEPTACARPUS SP SD 1	1			1
PANDALUS PLATYCEROS	1			1
PANULIRUS INTERRUPTUS		1		1
SICYONIA INGENTIS		1		1
QUARTER	49	26	10	85

Appendix C.2

Summary of demersal fish species captured in 22 trawls off of Point Loma, San Diego during 2003. Data depicts total abundance (N) and minimum, maximum and mean length.

			LENGTH		
Taxon/Species	**Common Name**	**N**	**Min**	**Max**	**Mean**
RAJIFORMES					
Rajidae					
Raja inornata	California skate	7	14	57	33
OSMERIFORMES					
Argentinidae					
Argentina sialis	Pacific argentine	18	4	12	7
AULOPIFORMES					
Synodontidae					
Synodus lucioceps	California lizardfish	28	18	40	26
OPHIDIIFORMES					
Ophidiidae					
Chilara taylori	spotted cuskeel	8	13	24	16
GADIFORMES					
Merlucciidae					
Merluccius productus	Pacific hake	1	20	20	20
BATRACHOIDIFORMES					
Batrachoididae					
Porichthys notatus	plainfin midshipman	95	5	18	11
LAMPRIFORMIS					
Trachipteridae					
Trachipterus altivelis	King-of-the-salmon	1	11	11	11
SCORPAENIFORMES					
Scorpaenidae	(juv. rockfish unid.)	7	6	11	8
Scorpaena guttata	California scorpionfish	146	12	26	20
Sebastes chlorostictus	greenspotted rockfish	3	8	10	9
Sebastes elongatus	greenstriped rockfish	9	4	10	7
Sebastes levis	cowcod	2	6	7	7
Sebastes rosenblatti	greenblotched rockfish	1	11	11	11
Sebastes rubrivinctus	flag rockfish	4	5	7	6
Sebastes saxicola	stripetail rockfish	185	3	13	9
Sebastes semicinctus	halfbanded rockfish	45	5	13	10
Triglidae					
Prionotus stephanophrys	lumptail searobin	1	20	20	20
Hexagrammidae					
Zaniolepis frenata	shortspine combfish	77	8	17	13
Zaniolepis latipinnis	longspine combfish	329	6	17	12
Cottidae	(juv. sculpin unid.)	1	14	14	14
Chitonotus pugetensis	roughback sculpin	8	7	11	9
Icelinus quadriseriatus	yellowchin sculpin	1381	3	8	6
Icelinus tenuis	spotfin sculpin	45	4	11	8
Agonidae					
Odontopyxis trispinosa	pygmy poacher	5	8	13	10
Xeneretmus latifrons	blacktip poacher	1	14	14	14
Xeneretmus triacanthus	bluespotted poacher	7	12	14	13

Appendix C.2 *continued*

Taxon/Species	Common Name	N	LENGTH Min	Max	Mean
PERCIFORMES					
Sciaenidae					
Genyonemus lineatus	white croaker	1	24	24	24
Embiotocidae					
Zalembius rosaceus	pink seaperch	100	4	15	8
Bathymasteridae					
Rathbunella hypoplecta	stripedfin ronquil	2	11	11	11
Zoarcidae					
Lycodopsis pacifica	blackbelly eelpout	57	12	24	18
Gobiidae					
Coryphoterus nicholsii	blackeye goby	2	6	7	7
Lepidogobius lepidus	bay goby	13	5	8	6
PLEURONECTIFORMES	(juv. flatfish unid.)	19	4	5	5
Paralichthyidae					
Citharichthys fragilis	gulf sanddab	5	9	12	10
Citharichthys sordidus	Pacific sanddab	3866	4	23	11
Citharichthys xanthostigma	longfin sanddab	148	10	19	14
Hippoglossina stomata	bigmouth sole	9	15	21	17
Pleuronectidae					
Eopsetta exilis	slender sole	51	12	17	13
Microstomus pacificus	Dover sole	326	4	19	10
Pleuronectes vetulus	English sole	46	12	23	17
Pleuronichthys verticalis	hornyhead turbot	8	14	24	18
Cynoglossidae					
Symphurus atricauda	California tonguefish	114	11	17	13

Taxonomic arrangement from Nelson 1994.

Appendix C.3

Demersal fish abundance and biomass by station, January 2003 survey.

NAME	SD7	SD8	SD9	SD10	SD11	SD12	SD13	SD14	SPECIES ABUNDANCE BY SURVEY
YELLOWCHIN SCULPIN	81	8	114	169	129	558	136	76	1271
PACIFIC SANDDAB	81	102	94	165	63	117	256	316	1194
LONGSPINE COMBFISH	3	3	19	26	12	47	21	3	134
LONGFIN SANDDAB	7	3	17	7	24	1	52	21	132
CALIFORNIA SCORPIONFISH			31	15	30	24	2		102
CALIFORNIA TONGUEFISH	14	11	4	2	6	13	10	3	63
STRIPETAIL ROCKFISH	2	11	14	1	2	1	7	18	56
ENGLISH SOLE	1	3	12	23	1		2	2	44
SHORTSPINE COMBFISH	4	20	1	3	1	6		4	39
DOVER SOLE	2	7		3	3	13	2	3	33
CALIFORNIA LIZARDFISH	1		20	2	2		1	1	27
SPOTFIN SCULPIN	1	23		1					25
PLAINFIN MIDSHIPMAN	4	2	2	1	5			4	18
PINK SEAPERCH	5				1	1	5	5	17
HORNYHEAD TURBOT		1			2	2	1		6
BAY GOBY							3	2	5
BIGMOUTH SOLE				1			3	1	5
ROUGHBACK SCULPIN			1		4				5
GULF SANDDAB	1	3							4
CALIFORNIA SKATE	1							1	2
FLAG ROCKFISH		2							2
PYGMY POACHER		2							2
SPOTTED CUSKEEL							2		2
BLUESPOTTED POACHER	1								1
GREENSPOTTED ROCKFISH		1							1
HALFBANDED ROCKFISH		1							1
LUMPTAIL SEAROBIN			1						1
ROCKFISH UNID.		1							1
WHITE CROAKER				1					1
TOTAL	209	204	330	420	285	783	503	460	3194

NAME	SD7	SD8	SD9	SD10	SD11	SD12	SD13	SD14	BIOMASS BY SPECIES
CALIFORNIA SCORPIONFISH			10.2	4.2	8.9	6.7	0.9		30.9
PACIFIC SANDDAB	0.5	1.0	0.5	2.0	0.3	1.1	4.6	6.1	16.1
LONGFIN SANDDAB	0.2	0.2	0.9	0.4	1.3	0.1	2.7	0.8	6.6
YELLOWCHIN SCULPIN	0.3	0.1	0.5	0.9	0.5	2.7	0.8	0.4	6.2
CALIFORNIA LIZARDFISH	0.1		4.0	0.6	0.7		0.1	0.1	5.6
ENGLISH SOLE	0.1	0.4	1.0	1.9	0.1		0.2	0.1	3.8
LONGSPINE COMBFISH	0.1	0.1	0.5	0.4	0.3	0.8	0.4	0.1	2.7
CALIFORNIA TONGUEFISH	0.2	0.2	0.1	0.1	0.2	0.3	0.2	0.1	1.4
HORNYHEAD TURBOT		0.1			0.2	0.7	0.2		1.2
CALIFORNIA SKATE	1.0							0.1	1.1
SHORTSPINE COMBFISH	0.1	0.5	0.1	0.1	0.1	0.1		0.1	1.1
STRIPETAIL ROCKFISH	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.2	1.1
DOVER SOLE	0.1	0.1		0.1	0.1	0.2	0.1	0.1	0.8
PLAINFIN MIDSHIPMAN	0.1	0.1	0.1	0.1	0.1			0.1	0.6
PINK SEAPERCH	0.1				0.1	0.1	0.1	0.1	0.5
BIGMOUTH SOLE				0.1			0.2	0.1	0.4
WHITE CROAKER				0.3					0.3
SPOTFIN SCULPIN	0.1	0.1		0.1					0.3
BAY GOBY							0.1	0.1	0.2
GULF SANDDAB	0.1	0.1							0.2
LUMPTAIL SEAROBIN			0.2						0.2
ROUGHBACK SCULPIN			0.1		0.1				0.2
BLUESPOTTED POACHER	0.1								0.1
FLAG ROCKFISH		0.1							0.1
GREENSPOTTED ROCKFISH		0.1							0.1
HALFBANDED ROCKFISH		0.1							0.1
PYGMY POACHER		0.1							0.1
ROCKFISH UNID.		0.1							0.1
SPOTTED CUSKEEL							0.1		0.1
TOTAL	3.3	3.6	18.4	11.4	13.1	12.9	10.9	8.6	82.2

Appendix C.3 *continued.*

Demersal fish abundance and biomass by station, Arpil 2003 survey.

NAME	SD7	SD8	SD9	SD10	SD11	SD12	SD13	SD14	SPECIES ABUNDANCE BY SURVEY
PACIFIC SANDDAB	164	35	48	120	181	115	308	104	1075
LONGSPINE COMBFISH	1				84	38	7	3	133
STRIPETAIL ROCKFISH		1	13	4	44	15	11	27	115
PLAINFIN MIDSHIPMAN	1	3	6	3	41	7	8	4	73
YELLOWCHIN SCULPIN	4		25	3	32		6	1	71
DOVER SOLE	5	5	2	5	27	4	9	9	66
PINK SEAPERCH	1		1	1	13	10	21	8	55
CALIFORNIA SCORPIONFISH	2	1		30	2	6	1	1	43
CALIFORNIA TONGUEFISH	8	3	10	5	2	3	3	1	35
HALFBANDED ROCKFISH		1		2	1	13	2	1	20
LONGFIN SANDDAB			4		10		2		16
SPOTFIN SCULPIN		15							15
SLENDER SOLE						2	1	11	14
SHORTSPINE COMBFISH	2	6		1			1		10
BLUESPOTTED POACHER	2	1		1			1		5
PACIFIC ARGENTINE		1				1	3		5
BAY GOBY			1		1			2	4
BLACKBELLY EELPOUT							4		4
SPOTTED CUSKEEL	1			1	2				4
BIGMOUTH SOLE				1	1		1		3
CALIFORNIA SKATE							2	1	3
GREENSTRIPED ROCKFISH	1	1		1					3
PYGMY POACHER						1		2	3
GREENSPOTTED ROCKFISH		1		1					2
ROCKFISH UNID.								2	2
BLACKEYE GOBY		1							1
CALIFORNIA LIZARDFISH							1		1
FLAG ROCKFISH						1			1
FLATFISH UNID.	1								1
GREENBLOTCHED ROCKFISH								1	1
HORNYHEAD TURBOT					1				1
SCULPIN UNID.		1							1
TOTAL	193	76	110	179	442	216	392	178	1786

NAME	SD7	SD8	SD9	SD10	SD11	SD12	SD13	SD14	BIOMASS BY SPECIES
PACIFIC SANDDAB	2.5	0.8	0.8	1.5	2.1	1.9	3.1	0.5	13.2
CALIFORNIA SCORPIONFISH	0.5	0.3		9.1	0.7	1.4	0.3	0.3	12.6
LONGSPINE COMBFISH	0.1				1.6	1.0	0.1	0.1	2.9
STRIPETAIL ROCKFISH		0.1	0.2	0.2	1.0	0.1	0.1	0.5	2.2
PLAINFIN MIDSHIPMAN	0.1	0.1	0.1	0.1	1.0	0.1	0.1	0.1	1.7
CALIFORNIA SKATE							0.1	1.3	1.4
DOVER SOLE	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.3	1.2
CALIFORNIA TONGUEFISH	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9
LONGFIN SANDDAB			0.1		0.5		0.1		0.7
HALFBANDED ROCKFISH		0.1		0.1	0.1	0.2	0.1	0.1	0.7
PINK SEAPERCH	0.1		0.1	0.1	0.1	0.1	0.1	0.1	0.7
YELLOWCHIN SCULPIN	0.1		0.1	0.1	0.1		0.1	0.1	0.6
SLENDER SOLE						0.1	0.1	0.3	0.5
SHORTSPINE COMBFISH	0.1	0.2		0.1			0.1		0.5
BLUESPOTTED POACHER	0.1	0.1		0.1			0.1		0.4
BAY GOBY			0.1		0.1			0.1	0.3
BIGMOUTH SOLE				0.1	0.1		0.1		0.3
GREENSTRIPED ROCKFISH	0.1	0.1		0.1					0.3
PACIFIC ARGENTINE		0.1				0.1	0.1		0.3
SPOTTED CUSKEEL	0.1			0.1	0.1				0.3
GREENSPOTTED ROCKFISH		0.1		0.1					0.2
PYGMY POACHER						0.1		0.1	0.2
BLACKBELLY EELPOUT							0.1		0.1
BLACKEYE GOBY		0.1							0.1
CALIFORNIA LIZARDFISH							0.1		0.1
FLAG ROCKFISH						0.1			0.1
FLATFISH UNID.	0.1								0.1
GREENBLOTCHED ROCKFISH								0.1	0.1
HORNYHEAD TURBOT					0.1				0.1
ROCKFISH UNID.								0.1	0.1
SCULPIN UNID.		0.1							0.1
SPOTFIN SCULPIN		0.1							0.1
TOTAL	4.3	2.5	1.7	12.1	7.8	5.4	5.1	4.2	43.1

Appendix C.3 *continued.*

Demersal fish abundance and biomass by station, July 2003 survey.

NAME	SD7	SD8	SD9	SD10	SD11	SD12	SD13	SD14	SPECIES ABUNDANCE BY SURVEY
QUARTER 3									
PACIFIC SANDDAB	218	130		248		109	453	439	1597
DOVER SOLE	22	25		56		30	66	28	227
LONGSPINE COMBFISH	5	2				16	34	5	62
BLACKBELLY EELPOUT						8	34	11	53
YELLOWCHIN SCULPIN	23			11			5		39
SLENDER SOLE				9		19	8	1	37
PINK SEAPERCH	7	3		3		1	8	6	28
SHORTSPINE COMBFISH	8	8		1		8	2	1	28
HALFBANDED ROCKFISH		1		7		9	6	1	24
FLATFISH UNID.						4		14	18
CALIFORNIA TONGUEFISH	3	7		2		1	2	1	16
STRIPETAIL ROCKFISH							7	7	14
PACIFIC ARGENTINE	13								13
GREENSTRIPED ROCKFISH	1	3				2			6
SPOTFIN SCULPIN		5							5
BAY GOBY	1	3							4
PLAINFIN MIDSHIPMAN	2			1			1		4
ROCKFISH UNID.							1	3	4
ROUGHBACK SCULPIN	3								3
CALIFORNIA SKATE				2					2
COWCOD							2		2
ENGLISH SOLE				1				1	2
SPOTTED CUSKEEL						2			2
STRIPEDFIN RONQUIL	1	1							2
BIGMOUTH SOLE								1	1
BLACKEYE GOBY		1							1
BLACKTIP POACHER								1	1
BLUESPOTTED POACHER								1	1
CALIFORNIA SCORPIONFISH							1		1
FLAG ROCKFISH				1					1
GULF SANDDAB								1	1
HORNYHEAD TURBOT				1					1
PACIFIC HAKE								1	1
RIBBONFISH				1					1
TOTAL	307	189	0	344	0	209	630	523	2202

NAME	SD7	SD8	SD9	SD10	SD11	SD12	SD13	SD14	BIOMASS BY SPECIES
PACIFIC SANDDAB	0.6	1.9		1.9		2.1	9.0	15.9	31.4
DOVER SOLE	0.5	0.3		0.6		0.4	0.7	0.7	3.2
BLACKBELLY EELPOUT						0.2	0.8	0.2	1.2
SLENDER SOLE				0.4		0.4	0.2	0.1	1.1
CALIFORNIA SKATE				1.0					1.0
LONGSPINE COMBFISH	0.1	0.1				0.3	0.4	0.1	1.0
SHORTSPINE COMBFISH	0.2	0.3		0.1		0.1	0.1	0.1	0.9
PINK SEAPERCH	0.1	0.1		0.2		0.1	0.2	0.2	0.9
HALFBANDED ROCKFISH		0.1		0.2		0.2	0.1	0.1	0.7
CALIFORNIA TONGUEFISH	0.1	0.1		0.1		0.1	0.1	0.1	0.6
STRIPETAIL ROCKFISH							0.2	0.2	0.4
ENGLISH SOLE				0.1				0.2	0.3
GREENSTRIPED ROCKFISH	0.1	0.1				0.1			0.3
PLAINFIN MIDSHIPMAN	0.1			0.1			0.1		0.3
YELLOWCHIN SCULPIN	0.1			0.1			0.1		0.3
BAY GOBY	0.1	0.1							0.2
FLATFISH UNID.						0.1		0.1	0.2
HORNYHEAD TURBOT				0.2					0.2
ROCKFISH UNID.							0.1	0.1	0.2
STRIPEDFIN RONQUIL	0.1	0.1							0.2
BIGMOUTH SOLE								0.1	0.1
BLACKEYE GOBY		0.1							0.1
BLACKTIP POACHER								0.1	0.1
BLUESPOTTED POACHER								0.1	0.1
CALIFORNIA SCORPIONFISH							0.1		0.1
COWCOD							0.1		0.1
FLAG ROCKFISH				0.1					0.1
GULF SANDDAB								0.1	0.1
PACIFIC ARGENTINE	0.1								0.1
PACIFIC HAKE								0.1	0.1
RIBBONFISH				0.1					0.1
ROUGHBACK SCULPIN	0.1								0.1
SPOTFIN SCULPIN		0.1							0.1
SPOTTED CUSKEEL						0.1			0.1
TOTAL	2.3	3.4	0.0	5.2	0.0	4.2	12.3	18.6	46.0

Appendix C.4

Summary of megabenthic invertebrate species captured in 22 trawls off of Point Loma, San Diego during 2003. Data are number of individuals collected (N).

Taxon/Species	N
PORIFERA	1
CNIDARIA	
ANTHOZOA	
Alcyonacea	
Gorgoniidae	
Eugorgia rubens	1
Muriceidae	
Thesea sp B	45
Pennatulacea	
Virgulariidae	
Acanthoptilum sp	823
Actiniaria	
Metridiidae	
Metridium [senile (=spp complex)]	5
MOLLUSCA	
GASTROPODA	
Vetigastropoda	
Calliostomatidae	
Calliostoma turbinum	2
Neotaenioglossa	
Naticidae	
Polinices draconis	1
Neogastropoda	
Nassariidae	
Nassarius insculptus	1
Fasciolariidae	
Fusinus barbarensis	4
Cancellariidae	
Cancellaria cooperii	1
Turridae	
Antiplanes catalinae	1
Megasurcula carpenteriana	14
Cephalaspidea	
Philinidae	
Philine auriformis	16
Notaspidea	
Pleurobranchidae	
Pleurobranchaea californica	3
Nudibranchia	
Platydorididae	
Platydoris macfarlandi	2
Tritoniidae	
Tritonia diomedea	2
Arminidae	
Armina californica	7

Appendix C.4 *continued*

Taxon/Species	N
CEPHALOPODA	
Sepiolida	
Sepiolidae	
Rossia pacifica	25
Teuthida	
Loliginidae	
Loligo opalescens	18
Octopoda	
Octopodidae	
Octopus rubescens	11
ARTHROPODA	
PYCNOGONIDA	
Pegmata	
Nymphonidae	
Nymphon pixellae	18
MALACOSTRACA	
Stomatopoda	
Hemisquillidae	
Hemisquilla ensigera californiensis	2
ISOPODA	
Corallanidae	
Excorallana truncata	2
Cymothoidae	
Elthusa vulgaris	5
DECAPODA	
Sicyoniidae	
Sicyonia ingentis	5
Hippolytidae	
Heptacarpus tenuissimus	2
Crangonidae	
Crangon alaskensis	45
Neocrangon resima	3
Neocrangon zacae	16
Diogenidae	
Paguristes turgidus	5
Paguridae	1
Calappidae	
Platymera gaudichaudii	18
Majidae	
Loxorhynchus crispatus	4
Loxorhynchus grandis	4
Palicidae	
Palicus cortezi	1
ECHINODERMATA	
CRINOIDEA	
Comatulida	
Antedonidae	
Florometra serratissima	10
ASTEROIDEA	
Paxillosida	
Luidiidae	
Luidia asthenosoma	3

Appendix C.4 *continued*

Taxon/Species	N
Luidia foliolata	52
Astropectinidae	
Astropecten ornatissimus	1
Astropecten verrilli	94
Astropecten sp	1
Valvatida	
Goniasteridae	
Ceramaster patagonicus	1
Mediaster aequalis	1
Forcipulatida	
Asteriidae	
Rathbunaster californicus	1
OPHIUROIDEA	
Ophiurida	
Ophiacanthidae	
Ophiacantha diplasia	1
Ophiactidae	
Ophiopholis bakeri	14
Amphiuridae	
Amphichondrius granulatus	7
Amphiodia urtica	1
Ophiotricidae	
Ophiothrix spiculata	3
Ophiuridae	
Ophiura luetkenii	23
ECHINOIDEA	
Temnopleuroida	
Toxopneustidae	
Lytechinus pictus	53135
Echinoida	
Strongylocentrotidae	
Allocentrotus fragilis	4
Spatangoida	
Spatangidae	
Spatangus californicus	5
HOLOTHURIODEA	
DENDROCHIROTIDA	
Cucumariidae	
Cucumaria piperata	1
Aspidochirotida	
Stichopodidae	
Parastichopus californicus	83
CHORDATA	
ASCIDIACEA	
Styelidae	
Stylea sp	1

SCAMIT Ed. 4th, October 2001

APPENDIX D

2003 PLOO Stations

Bioaccumulation of Contaminants in Fish Tissues

“Supplemental Data”

Appendix D.1

Lengths and weights of fishes used in composite samples for April and October 2003.

Station	Rep	Species	N	Length min	Length max	Length avg	Weight min	Weight max	Weight avg
April 2003									
RF1	1	Vermilion Rockfish	3	26	28	27	418	562	478
RF1	2	Rockfish Unid	3	18	39	26	145	1400	588
RF1	3	Vermilion Rockfish	3	24	30	27	383	700	513
RF2	1	Rockfish Unid	3	20	44	33	181	1100	710
RF2	2	Bocaccio	3	39	44	41	900	1200	1017
RF2	3	Rockfish Unid	3	22	54	35	300	2300	1019
SD7	1	Pacific Sanddab	12	13	18	15	36	99	55
SD7	2	California Scorpionfish	3	18	22	20	179	406	305
SD7	3	California Scorpionfish	3	18	25	21	219	574	339
SD8	1	California Scorpionfish	3	19	23	21	288	390	336
SD8	2	Pacific Sanddab	10	13	22	15	28	183	55
SD8	3	Pacific Sanddab	15	13	16	14	27	53	37
SD9	1	Longfin Sanddab	11	14	17	15	53	83	63
SD9	2	Pacific Sanddab	5	14	16	15	47	71	56
SD9	3	Longfin Sanddab	19	12	14	13	35	59	43
SD10	1	California Scorpionfish	3	21	22	22	312	395	347
SD10	2	California Scorpionfish	3	20	24	21	268	504	349
SD10	3	California Scorpionfish	3	22	24	23	309	430	389
SD11	1	Longfin Sanddab	19	12	15	14	12	66	46
SD11	2	California Scorpionfish	3	24	25	24	403	463	435
SD11	3	California Scorpionfish	3	20	23	22	284	408	354
SD12	1	Pacific Sanddab	9	14	19	17	43	90	68
SD12	2	California Scorpionfish	3	18	24	20	165	460	268
SD12	3	California Scorpionfish	3	19	20	19	220	245	236
SD13	1	California Scorpionfish	3	20	22	21	231	336	298
SD13	2	Longfin Sanddab	14	12	15	13	36	67	45
SD13	3	Pacific Sanddab	12	13	18	15	36	85	47
SD14	1	Pacific Sanddab	8	14	22	17	42	166	77
SD14	2	Pacific Sanddab	12	13	19	15	34	114	56
SD14	3	California Scorpionfish	3	20	26	23	303	553	416

Appendix D.1 *continued*

Station	Rep	Species	N	Length min	Length max	Length avg	Weight min	Weight max	Weight avg
October 2003									
RF1	1	Copper Rockfish	3	29	40	36	750	1800	1383
RF1	2	Rockfish Unid	3	26	31	28	400	850	617
RF1	3	Vermilion Rockfish	3	27	31	29	500	800	700
RF2	1	Vermilion Rockfish	3	29	35	32	600	1200	867
RF2	2	Vermilion Rockfish	3	33	35	34	1000	1200	1067
RF2	3	Vermilion Rockfish	3	32	35	34	900	1200	1067
ZONE 1	1	English Sole	3	20	22	21	143	184	158
ZONE 1	2	English Sole	4	18	23	20	103	207	143
ZONE 1	3	English Sole	4	20	22	21	108	157	135
ZONE 1	4	Pacific Sanddab	5	18	23	19	88	203	119
ZONE 1	5	Pacific Sanddab	6	17	20	19	67	133	99
ZONE 1	6	Pacific Sanddab	5	17	23	19	78	187	108
ZONE 1	7	Hornyhead Turbot	4	16	18	18	138	170	154
ZONE 1	8	Hornyhead Turbot	3	14	16	15	66	112	84
ZONE 2	1	Longfin Sanddab	8	14	18	15	51	113	67
ZONE 2	2	Longfin Sanddab	13	12	15	14	37	79	52
ZONE 2	3	Longfin Sanddab	10	12	16	14	38	84	55
ZONE 2	4	English Sole	3	21	25	22	141	268	192
ZONE 2	5	English Sole	4	19	24	21	122	217	155
ZONE 2	6	English Sole	5	16	20	19	69	134	117
ZONE 2	7	Pacific Sanddab	5	17	20	18	67	142	94
ZONE 2	8	Pacific Sanddab	7	16	23	18	63	178	89
ZONE 2	9	Pacific Sanddab	5	16	22	18	57	168	92
ZONE 3	1	Pacific Sanddab	9	14	20	16	42	123	69
ZONE 3	2	Pacific Sanddab	5	16	21	18	57	136	95
ZONE 3	3	Pacific Sanddab	13	14	17	15	36	71	45
ZONE 4	1	Pacific Sanddab	8	14	17	15	38	72	53
ZONE 4	2	Pacific Sanddab	10	14	18	15	35	83	47
ZONE 4	3	Pacific Sanddab	9	14	20	16	42	110	62
ZONE 4	4	Bigmouth Sole	5	16	20	18	60	105	87
ZONE 4	5	Longfin Sanddab	5	13	16	14	43	77	57

Appendix D.2

Analyzed constituents for fish tissue samples for April and October 2003.

Chlorinated Pesticides			
Aldrin	BHC, Delta isomer	Heptachlor epoxide	p,p-DDD
Alpha (cis) Chlordane	BHC, Gamma isomer	Hexachlorobenzene	p,p-DDE
Gamma (trans) Chlordane	Cis Nonachlor	Mirex	p,p-DDT
Alpha Endosulfan	Dieldrin	o,p-DDD	Oxychlordane
BHC, Alpha isomer	Endrin	o,p-DDE	Trans Nonachlor
BHC, Beta isomer	Heptachlor	o,p-DDT	Toxaphene

Polycyclic Aromatic Hydrocarbons (April only)			
1-methylnaphthalene	Acenaphthene	Benzo(e)pyrene	Fluorene
1-methylphenanthrene	Acenaphthylene	Benzo(G,H,I)perylene	Indeno(1,2,3-CD)pyrene
2,3,5-trimethylnaphthalene	Anthracene	Benzo(K)fluoranthene	Naphthalene
2,6-dimethylnaphthalene	Benzo(A)anthracene	Biphenyl	Perylene
2-methylnaphthalene	Dibenzo(A,H)anthracene	Chrysene	Phenanthrene
3,4-benzo(B)fluoranthene	Benzo(A)pyrene	Fluoranthene	Pyrene

Metals			
Aluminum (Al)	Cadmium (Cd)	Manganese (Mn)	Thallium (Th)
Antimony (Sb)	Chromium (Cr)	Mercury (Hg)	Tin (Sn)
Arsenic (As)	Copper (Cu	Nickel (Ni)	Zinc (Zn)
Barium (Ba) (Oct only)	Iron (Fe)	Selenium (Se)	
Beryllium (Be)	Lead (Pb)	Silver (Ag)	

PCB Congeners			
PCB 18	PCB 81	PCB 126	PCB 169
PCB 28	PCB 87	PCB 128	PCB 170
PCB 37	PCB 99	PCB 138	PCB 177
PCB 44	PCB 101	PCB 149	PCB 180
PCB 49	PCB 105	PCB 151	PCB 183
PCB 52	PCB 110	PCB 153/168	PCB 187
PCB 66	PCB 114	PCB 156	PCB 189
PCB 70	PCB 118	PCB 157	PCB 194
PCB 74	PCB 119	PCB 158	PCB 201
PCB 77	PCB 123	PCB 167	PCB 206

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF1	1	Vermilion rockfish	liver	Alpha (cis) Chlordane	E	3.4	ug/kg	
RF1	1	Vermilion rockfish	liver	Aluminum		7.9	mg/kg	2.6
RF1	1	Vermilion rockfish	liver	Arsenic		3.1	mg/kg	1.4
RF1	1	Vermilion rockfish	muscle	Arsenic		2.6	mg/kg	1.4
RF1	1	Vermilion rockfish	liver	Cadmium		0.41	mg/kg	0.34
RF1	1	Vermilion rockfish	muscle	Chromium		0.327	mg/kg	0.3
RF1	1	Vermilion rockfish	liver	Copper		5.26	mg/kg	0.76
RF1	1	Vermilion rockfish	muscle	Copper		2.21	mg/kg	0.76
RF1	1	Vermilion rockfish	liver	Iron		106	mg/kg	1.3
RF1	1	Vermilion rockfish	muscle	Iron		13.4	mg/kg	1.3
RF1	1	Vermilion rockfish	liver	Lipids		19.3	%wt	0.005
RF1	1	Vermilion rockfish	muscle	Lipids		0.1	%wt	0.005
RF1	1	Vermilion rockfish	liver	Manganese		0.72	mg/kg	0.23
RF1	1	Vermilion rockfish	liver	Mercury		0.09	mg/kg	0.03
RF1	1	Vermilion rockfish	muscle	Mercury		1.25	mg/kg	0.03
RF1	1	Vermilion rockfish	liver	o,p-DDE	E	2.4	ug/kg	
RF1	1	Vermilion rockfish	liver	p,p-DDD	E	5.3	ug/kg	
RF1	1	Vermilion rockfish	liver	p,p-DDE		210	ug/kg	13.3
RF1	1	Vermilion rockfish	muscle	p,p-DDE		3	ug/kg	1.33
RF1	1	Vermilion rockfish	liver	p,p-DDT	E	13	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 101	E	11	ug/kg	
RF1	1	Vermilion rockfish	muscle	PCB 101	E	0.2	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 105	E	4.8	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 110	E	7.1	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 118		15	ug/kg	13.3
RF1	1	Vermilion rockfish	liver	PCB 123	E	2	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 128	E	5	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 138		20	ug/kg	13.3
RF1	1	Vermilion rockfish	muscle	PCB 138	E	0.3	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 149	E	9	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 151	E	2.4	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 153/168		35	ug/kg	13.3
RF1	1	Vermilion rockfish	muscle	PCB 153/168	E	0.5	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 156	E	2.3	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 157	E	1.5	ug/kg	
RF1	1	Vermilion rockfish	muscle	PCB 157	E	0.1	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 158	E	2.4	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 167	E	2.2	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 170	E	6.9	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 177	E	3.6	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 180		15	ug/kg	13.3
RF1	1	Vermilion rockfish	muscle	PCB 180	E	0.2	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 183	E	4.5	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 187	E	13	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 194	E	4.5	ug/kg	
RF1	1	Vermilion rockfish	muscle	PCB 194	E	0.1	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 206	E	4.4	ug/kg	
RF1	1	Vermilion rockfish	muscle	PCB 206	E	0.2	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 52	E	2.7	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 66	E	2.4	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 70	E	1.4	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF1	1	Vermilion rockfish	liver	PCB 87	E	2.5	ug/kg	
RF1	1	Vermilion rockfish	liver	PCB 99	E	9.5	ug/kg	
RF1	1	Vermilion rockfish	liver	Selenium		1.89	mg/kg	0.06
RF1	1	Vermilion rockfish	muscle	Selenium		0.292	mg/kg	0.06
RF1	1	Vermilion rockfish	liver	Total Solids		40.9	%wt	0.4
RF1	1	Vermilion rockfish	muscle	Total Solids		20.4	%wt	0.4
RF1	1	Vermilion rockfish	liver	Trans Nonachlor	E	5.5	ug/kg	
RF1	1	Vermilion rockfish	liver	Zinc		25.1	mg/kg	0.58
RF1	1	Vermilion rockfish	muscle	Zinc		3.46	mg/kg	0.58
RF1	2	Mixed rockfish	liver	Alpha (cis) Chlordane	E	7.6	ug/kg	
RF1	2	Mixed rockfish	muscle	Alpha (cis) Chlordane	E	1	ug/kg	
RF1	2	Mixed rockfish	liver	Aluminum		6.9	mg/kg	2.6
RF1	2	Mixed rockfish	muscle	Aluminum		6	mg/kg	2.6
RF1	2	Mixed rockfish	liver	Arsenic		1.5	mg/kg	1.4
RF1	2	Mixed rockfish	muscle	Arsenic		1.5	mg/kg	1.4
RF1	2	Mixed rockfish	liver	Cadmium		1.4	mg/kg	0.34
RF1	2	Mixed rockfish	liver	Chromium		0.52	mg/kg	0.3
RF1	2	Mixed rockfish	liver	Copper		12.1	mg/kg	0.76
RF1	2	Mixed rockfish	muscle	Copper		1.02	mg/kg	0.76
RF1	2	Mixed rockfish	muscle	Hexachlorobenzene	E	0.7	ug/kg	
RF1	2	Mixed rockfish	liver	Iron		76.2	mg/kg	1.3
RF1	2	Mixed rockfish	muscle	Iron		11.3	mg/kg	1.3
RF1	2	Mixed rockfish	liver	Lipids		16.9	%wt	0.005
RF1	2	Mixed rockfish	muscle	Lipids		2.2	%wt	0.005
RF1	2	Mixed rockfish	liver	Manganese		0.93	mg/kg	0.23
RF1	2	Mixed rockfish	liver	Mercury		0.084	mg/kg	0.03
RF1	2	Mixed rockfish	muscle	Mercury		0.285	mg/kg	0.03
RF1	2	Mixed rockfish	liver	o,p-DDE	E	12	ug/kg	
RF1	2	Mixed rockfish	muscle	o,p-DDE		1.5	ug/kg	1.33
RF1	2	Mixed rockfish	liver	p,p-DDD	E	7.4	ug/kg	
RF1	2	Mixed rockfish	muscle	p,p-DDD	E	1	ug/kg	
RF1	2	Mixed rockfish	liver	p,p-DDE		1320	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	p,p-DDE		79	ug/kg	1.33
RF1	2	Mixed rockfish	liver	p,p-DDT		20	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	p,p-DDT	E	1.1	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 101		21	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	PCB 101		1.8	ug/kg	1.33
RF1	2	Mixed rockfish	liver	PCB 105	E	9.4	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 105	E	0.8	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 110	E	9.7	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 110	E	0.9	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 118		37	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	PCB 118		2.9	ug/kg	1.33
RF1	2	Mixed rockfish	muscle	PCB 119	E	0.1	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 123	E	3	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 123	E	0.2	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 128	E	8.7	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 128	E	0.6	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 138		46	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	PCB 138		3.4	ug/kg	1.33
RF1	2	Mixed rockfish	liver	PCB 149	E	13	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF1	2	Mixed rockfish	muscle	PCB 149	E	1	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 151	E	5.7	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 151	E	0.5	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 153/168		77	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	PCB 153/168		5.9	ug/kg	1.33
RF1	2	Mixed rockfish	liver	PCB 156	E	3.5	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 156	E	0.4	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 157	E	0.1	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 158	E	4.5	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 158	E	0.3	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 167	E	2	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 170	E	12	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 170	E	1.1	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 177	E	3	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 177	E	0.3	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 180		32	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	PCB 180		2.6	ug/kg	1.33
RF1	2	Mixed rockfish	liver	PCB 183	E	9.8	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 183	E	0.7	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 187		26	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	PCB 187		2.1	ug/kg	1.33
RF1	2	Mixed rockfish	liver	PCB 194	E	9.9	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 194	E	0.7	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 206	E	7.2	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 206	E	0.5	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 28	E	7.4	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 28	E	0.4	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 44	E	2.9	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 49	E	6.8	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 49	E	0.5	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 52	E	7.5	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 52	E	0.8	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 66	E	6.2	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 66	E	0.4	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 70	E	3.6	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 74	E	4.3	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 87	E	3.3	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 87	E	0.3	ug/kg	
RF1	2	Mixed rockfish	liver	PCB 99		18	ug/kg	13.3
RF1	2	Mixed rockfish	muscle	PCB 99		1.5	ug/kg	1.33
RF1	2	Mixed rockfish	liver	Selenium		2.03	mg/kg	0.06
RF1	2	Mixed rockfish	muscle	Selenium		0.369	mg/kg	0.06
RF1	2	Mixed rockfish	liver	Total Solids		40.5	%wt	0.4
RF1	2	Mixed rockfish	muscle	Total Solids		22.1	%wt	0.4
RF1	2	Mixed rockfish	liver	Trans Nonachlor	E	12	ug/kg	
RF1	2	Mixed rockfish	muscle	Trans Nonachlor	E	1	ug/kg	
RF1	2	Mixed rockfish	liver	Zinc		47.1	mg/kg	0.58
RF1	2	Mixed rockfish	muscle	Zinc		4.73	mg/kg	0.58
RF1	3	Vermilion rockfish	liver	Aluminum		7.7	mg/kg	2.6
RF1	3	Vermilion rockfish	muscle	Aluminum		3.6	mg/kg	2.6
RF1	3	Vermilion rockfish	liver	Arsenic		2.3	mg/kg	1.4

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF1	3	Vermilion rockfish	muscle	Arsenic		2.1	mg/kg	1.4
RF1	3	Vermilion rockfish	muscle	Chromium		0.37	mg/kg	0.3
RF1	3	Vermilion rockfish	liver	Copper		3.12	mg/kg	0.76
RF1	3	Vermilion rockfish	muscle	Copper		8.56	mg/kg	0.76
RF1	3	Vermilion rockfish	liver	Iron		92.4	mg/kg	1.3
RF1	3	Vermilion rockfish	muscle	Iron		1.8	mg/kg	1.3
RF1	3	Vermilion rockfish	liver	Lipids		18.2	%wt	0.005
RF1	3	Vermilion rockfish	muscle	Lipids		0.26	%wt	0.005
RF1	3	Vermilion rockfish	liver	Manganese		1.01	mg/kg	0.23
RF1	3	Vermilion rockfish	liver	Mercury		0.053	mg/kg	0.03
RF1	3	Vermilion rockfish	muscle	Mercury		0.137	mg/kg	0.03
RF1	3	Vermilion rockfish	liver	o,p-DDE	E	2.15	ug/kg	
RF1	3	Vermilion rockfish	muscle	o,p-DDE	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	liver	p,p-DDD	E	4.3	ug/kg	
RF1	3	Vermilion rockfish	liver	p,p-DDE		185	ug/kg	13.3
RF1	3	Vermilion rockfish	muscle	p,p-DDE		5	ug/kg	1.33
RF1	3	Vermilion rockfish	liver	p,p-DDT	E	8.35	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 101	E	9.65	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 101	E	0.3	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 105	E	4.1	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 110	E	5.85	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 118		14.5	ug/kg	13.3
RF1	3	Vermilion rockfish	muscle	PCB 118	E	0.3	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 128	E	3.6	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 138		19	ug/kg	13.3
RF1	3	Vermilion rockfish	muscle	PCB 138	E	0.3	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 149	E	7.2	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 151	E	1.55	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 153/168		31.5	ug/kg	13.3
RF1	3	Vermilion rockfish	muscle	PCB 153/168	E	0.6	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 156	E	1.4	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 158	E	1.85	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 170	E	4.9	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 177	E	1.85	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 180	E	12	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 180	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 183	E	3.85	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 187	E	10	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 194	E	3.7	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 206	E	3.5	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 206	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 52	E	2.15	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 66	E	2.05	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 70	E	1.2	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 87	E	1.8	ug/kg	
RF1	3	Vermilion rockfish	liver	PCB 99	E	8.5	ug/kg	
RF1	3	Vermilion rockfish	liver	Selenium		1.63	mg/kg	0.06
RF1	3	Vermilion rockfish	muscle	Selenium		0.391	mg/kg	0.06
RF1	3	Vermilion rockfish	liver	Total Solids		32	%wt	0.4
RF1	3	Vermilion rockfish	muscle	Total Solids		21.2	%wt	0.4
RF1	3	Vermilion rockfish	liver	Trans Nonachlor	E	4.5	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF1	3	Vermilion rockfish	liver	Zinc		20.4	mg/kg	0.58
RF1	3	Vermilion rockfish	muscle	Zinc		3.6	mg/kg	0.58
RF2	1	Mixed rockfish	liver	Aluminum		4.3	mg/kg	2.6
RF2	1	Mixed rockfish	liver	Arsenic		1.6	mg/kg	1.4
RF2	1	Mixed rockfish	muscle	Arsenic		3.1	mg/kg	1.4
RF2	1	Mixed rockfish	liver	Cadmium		0.88	mg/kg	0.34
RF2	1	Mixed rockfish	liver	Chromium		0.42	mg/kg	0.3
RF2	1	Mixed rockfish	liver	Copper		7.47	mg/kg	0.76
RF2	1	Mixed rockfish	liver	Iron		102	mg/kg	1.3
RF2	1	Mixed rockfish	muscle	Iron		16	mg/kg	1.3
RF2	1	Mixed rockfish	liver	Lipids		4.7	%wt	0.005
RF2	1	Mixed rockfish	muscle	Lipids		0.18	%wt	0.005
RF2	1	Mixed rockfish	liver	Manganese		1.2	mg/kg	0.23
RF2	1	Mixed rockfish	liver	Mercury		0.26	mg/kg	0.03
RF2	1	Mixed rockfish	muscle	Mercury		0.191	mg/kg	0.03
RF2	1	Mixed rockfish	muscle	o,p-DDE	E	0.3	ug/kg	
RF2	1	Mixed rockfish	liver	p,p-DDD	E	1	ug/kg	
RF2	1	Mixed rockfish	liver	p,p-DDE		100	ug/kg	13.3
RF2	1	Mixed rockfish	muscle	p,p-DDE		5.7	ug/kg	1.33
RF2	1	Mixed rockfish	liver	p,p-DDT	E	3.6	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 101	E	3.6	ug/kg	
RF2	1	Mixed rockfish	muscle	PCB 101	E	0.2	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 118	E	5.2	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 138	E	6.7	ug/kg	
RF2	1	Mixed rockfish	muscle	PCB 138	E	0.2	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 149	E	2.4	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 153/168	E	13	ug/kg	
RF2	1	Mixed rockfish	muscle	PCB 153/168	E	0.4	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 180	E	4.9	ug/kg	
RF2	1	Mixed rockfish	muscle	PCB 180	E	0.1	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 183	E	1.3	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 187	E	3	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 194	E	1.3	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 206	E	1.5	ug/kg	
RF2	1	Mixed rockfish	muscle	PCB 206	E	0.1	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 66	E	0.7	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 70	E	0.5	ug/kg	
RF2	1	Mixed rockfish	liver	PCB 99	E	2.7	ug/kg	
RF2	1	Mixed rockfish	liver	Selenium		2.06	mg/kg	0.06
RF2	1	Mixed rockfish	muscle	Selenium		0.286	mg/kg	0.06
RF2	1	Mixed rockfish	liver	Silver		11.7	mg/kg	0.62
RF2	1	Mixed rockfish	liver	Total Solids		27.7	%wt	0.4
RF2	1	Mixed rockfish	muscle	Total Solids		20.2	%wt	0.4
RF2	1	Mixed rockfish	liver	Zinc		35.6	mg/kg	0.58
RF2	1	Mixed rockfish	muscle	Zinc		2.95	mg/kg	0.58
RF2	2	Bocaccio	liver	Alpha (cis) Chlordane	E	3.9	ug/kg	
RF2	2	Bocaccio	liver	Aluminum		10.7	mg/kg	2.6
RF2	2	Bocaccio	liver	Arsenic		1.4	mg/kg	1.4
RF2	2	Bocaccio	liver	Cadmium		0.95	mg/kg	0.34
RF2	2	Bocaccio	liver	Copper		21.1	mg/kg	0.76
RF2	2	Bocaccio	muscle	Copper		1.76	mg/kg	0.76

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF2	2	Bocaccio	liver	Iron		200	mg/kg	1.3
RF2	2	Bocaccio	muscle	Iron		7	mg/kg	1.3
RF2	2	Bocaccio	liver	Lipids		15.6	%wt	0.005
RF2	2	Bocaccio	muscle	Lipids		0.31	%wt	0.005
RF2	2	Bocaccio	liver	Manganese		1.06	mg/kg	0.23
RF2	2	Bocaccio	liver	Mercury		0.474	mg/kg	0.03
RF2	2	Bocaccio	muscle	Mercury		0.193	mg/kg	0.03
RF2	2	Bocaccio	liver	o,p-DDE	E	5.1	ug/kg	
RF2	2	Bocaccio	muscle	o,p-DDE	E	0.3	ug/kg	
RF2	2	Bocaccio	liver	p,p-DDD	E	5.2	ug/kg	
RF2	2	Bocaccio	muscle	p,p-DDD	E	0.2	ug/kg	
RF2	2	Bocaccio	liver	p,p-DDE		260	ug/kg	13.3
RF2	2	Bocaccio	muscle	p,p-DDE		6.1	ug/kg	1.33
RF2	2	Bocaccio	liver	p,p-DDT	E	9.7	ug/kg	
RF2	2	Bocaccio	muscle	p,p-DDT	E	0.2	ug/kg	
RF2	2	Bocaccio	liver	PCB 101	E	7.6	ug/kg	
RF2	2	Bocaccio	muscle	PCB 101	E	0.1	ug/kg	
RF2	2	Bocaccio	liver	PCB 105	E	2.1	ug/kg	
RF2	2	Bocaccio	liver	PCB 110	E	3.6	ug/kg	
RF2	2	Bocaccio	liver	PCB 118	E	8.6	ug/kg	
RF2	2	Bocaccio	liver	PCB 128	E	2.2	ug/kg	
RF2	2	Bocaccio	liver	PCB 138	E	11	ug/kg	
RF2	2	Bocaccio	muscle	PCB 138	E	0.2	ug/kg	
RF2	2	Bocaccio	liver	PCB 149	E	6.2	ug/kg	
RF2	2	Bocaccio	liver	PCB 151	E	2.1	ug/kg	
RF2	2	Bocaccio	liver	PCB 153/168		22	ug/kg	13.3
RF2	2	Bocaccio	muscle	PCB 153/168	E	0.3	ug/kg	
RF2	2	Bocaccio	liver	PCB 180	E	9.3	ug/kg	
RF2	2	Bocaccio	muscle	PCB 180	E	0.1	ug/kg	
RF2	2	Bocaccio	liver	PCB 183	E	2.7	ug/kg	
RF2	2	Bocaccio	liver	PCB 187	E	8.7	ug/kg	
RF2	2	Bocaccio	liver	PCB 194	E	1.9	ug/kg	
RF2	2	Bocaccio	liver	PCB 206	E	1.8	ug/kg	
RF2	2	Bocaccio	muscle	PCB 206	E	0.1	ug/kg	
RF2	2	Bocaccio	liver	PCB 52	E	1.6	ug/kg	
RF2	2	Bocaccio	liver	PCB 66	E	1.8	ug/kg	
RF2	2	Bocaccio	liver	PCB 70	E	1.1	ug/kg	
RF2	2	Bocaccio	liver	PCB 74	E	0.9	ug/kg	
RF2	2	Bocaccio	liver	PCB 87	E	1.6	ug/kg	
RF2	2	Bocaccio	liver	PCB 99	E	4.5	ug/kg	
RF2	2	Bocaccio	liver	Selenium		2.6	mg/kg	0.06
RF2	2	Bocaccio	muscle	Selenium		0.296	mg/kg	0.06
RF2	2	Bocaccio	liver	Total Solids		35.9	%wt	0.4
RF2	2	Bocaccio	muscle	Total Solids		22.3	%wt	0.4
RF2	2	Bocaccio	liver	Trans Nonachlor	E	4.7	ug/kg	
RF2	2	Bocaccio	liver	Zinc		76.6	mg/kg	0.58
RF2	2	Bocaccio	muscle	Zinc		3.15	mg/kg	0.58
RF2	3	Mixed rockfish	liver	Aluminum		4.07	mg/kg	2.6
RF2	3	Mixed rockfish	liver	Cadmium		1.47	mg/kg	0.34
RF2	3	Mixed rockfish	liver	Copper		11.5	mg/kg	0.76
RF2	3	Mixed rockfish	liver	Iron		219	mg/kg	1.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF2	3	Mixed rockfish	muscle	Iron		5.2	mg/kg	1.3
RF2	3	Mixed rockfish	liver	Lipids		6.33	%wt	0.005
RF2	3	Mixed rockfish	muscle	Lipids		0.15	%wt	0.005
RF2	3	Mixed rockfish	liver	Manganese		0.66	mg/kg	0.23
RF2	3	Mixed rockfish	liver	Mercury		1.13	mg/kg	0.03
RF2	3	Mixed rockfish	muscle	Mercury		0.524	mg/kg	0.03
RF2	3	Mixed rockfish	liver	o,p-DDE	E	2.8	ug/kg	
RF2	3	Mixed rockfish	muscle	o,p-DDE	E	0.3	ug/kg	
RF2	3	Mixed rockfish	liver	p,p-DDD	E	1.8	ug/kg	
RF2	3	Mixed rockfish	liver	p,p-DDE		170	ug/kg	13.3
RF2	3	Mixed rockfish	muscle	p,p-DDE		5.3	ug/kg	1.33
RF2	3	Mixed rockfish	liver	p,p-DDT	E	6.1	ug/kg	
RF2	3	Mixed rockfish	muscle	p,p-DDT	E	0.2	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 101	E	5	ug/kg	
RF2	3	Mixed rockfish	muscle	PCB 101	E	0.1	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 105	E	2	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 110	E	2.5	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 118	E	7	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 138	E	9.8	ug/kg	
RF2	3	Mixed rockfish	muscle	PCB 138	E	0.2	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 149	E	3.5	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 153/168		18	ug/kg	13.3
RF2	3	Mixed rockfish	muscle	PCB 153/168	E	0.3	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 180	E	7.6	ug/kg	
RF2	3	Mixed rockfish	muscle	PCB 180	E	0.1	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 183	E	1.9	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 187	E	6.3	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 194	E	1.5	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 206	E	1.7	ug/kg	
RF2	3	Mixed rockfish	muscle	PCB 206	E	0.1	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 66	E	0.9	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 70	E	0.6	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 74	E	0.6	ug/kg	
RF2	3	Mixed rockfish	liver	PCB 99	E	3	ug/kg	
RF2	3	Mixed rockfish	liver	Selenium		2.9	mg/kg	0.06
RF2	3	Mixed rockfish	muscle	Selenium		0.34	mg/kg	0.06
RF2	3	Mixed rockfish	liver	Total Solids		27.6	%wt	0.4
RF2	3	Mixed rockfish	muscle	Total Solids		20.4	%wt	0.4
RF2	3	Mixed rockfish	liver	Trans Nonachlor	E	2.4	ug/kg	
RF2	3	Mixed rockfish	liver	Zinc		50.9	mg/kg	0.58
RF2	3	Mixed rockfish	muscle	Zinc		2.78	mg/kg	0.58
SD7	1	Pacific sanddab	liver	Alpha (cis) Chlordane	E	10	ug/kg	
SD7	1	Pacific sanddab	liver	Aluminum		3.8	mg/kg	2.6
SD7	1	Pacific sanddab	muscle	Aluminum		5.85	mg/kg	2.6
SD7	1	Pacific sanddab	liver	Arsenic		2.8	mg/kg	1.4
SD7	1	Pacific sanddab	muscle	Arsenic		4.1	mg/kg	1.4
SD7	1	Pacific sanddab	liver	Cadmium		1.79	mg/kg	0.34
SD7	1	Pacific sanddab	liver	Copper		9.25	mg/kg	0.76
SD7	1	Pacific sanddab	muscle	Copper		9.7	mg/kg	0.76
SD7	1	Pacific sanddab	liver	Gamma (trans) Chlordane	E	2.2	ug/kg	
SD7	1	Pacific sanddab	liver	Hexachlorobenzene	E	6.2	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD7	1	Pacific sanddab	liver	Iron		77	mg/kg	1.3
SD7	1	Pacific sanddab	muscle	Iron		5.4	mg/kg	1.3
SD7	1	Pacific sanddab	liver	Lipids		39.4	%wt	0.005
SD7	1	Pacific sanddab	muscle	Lipids		0.6	%wt	0.005
SD7	1	Pacific sanddab	liver	Manganese		0.83	mg/kg	0.23
SD7	1	Pacific sanddab	muscle	Manganese		0.38	mg/kg	0.23
SD7	1	Pacific sanddab	liver	o,p-DDE		18	ug/kg	13.3
SD7	1	Pacific sanddab	liver	o,p-DDT	E	2.9	ug/kg	
SD7	1	Pacific sanddab	liver	p,p-DDD	E	9.7	ug/kg	
SD7	1	Pacific sanddab	liver	p,p-DDE		600	ug/kg	13.3
SD7	1	Pacific sanddab	muscle	p,p-DDE		1.8	ug/kg	1.33
SD7	1	Pacific sanddab	liver	p,p-DDT		35	ug/kg	13.3
SD7	1	Pacific sanddab	liver	PCB 101	E	12	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 105	E	5.3	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 110	E	9.4	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 118		17	ug/kg	13.3
SD7	1	Pacific sanddab	liver	PCB 123	E	2.1	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 128	E	4.9	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 138		22	ug/kg	13.3
SD7	1	Pacific sanddab	liver	PCB 149	E	7.9	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 151	E	4.8	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 153/168		39	ug/kg	13.3
SD7	1	Pacific sanddab	liver	PCB 156	E	1.7	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 157	E	0.9	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 158	E	1.6	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 167	E	1.6	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 170	E	6	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 177	E	3.4	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 180	E	13	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 183	E	4.1	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 187		14	ug/kg	13.3
SD7	1	Pacific sanddab	liver	PCB 194	E	3.1	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 201	E	5.3	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 206	E	2.8	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 37	E	1	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 49	E	2.7	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 52	E	4.7	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 66	E	3.6	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 70	E	4.1	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 74	E	2.3	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 87	E	3.3	ug/kg	
SD7	1	Pacific sanddab	liver	PCB 99	E	11	ug/kg	
SD7	1	Pacific sanddab	liver	Selenium		0.982	mg/kg	0.06
SD7	1	Pacific sanddab	muscle	Selenium		0.219	mg/kg	0.06
SD7	1	Pacific sanddab	liver	Total Solids		53.8	%wt	0.4
SD7	1	Pacific sanddab	muscle	Total Solids		19.6	%wt	0.4
SD7	1	Pacific sanddab	liver	Trans Nonachlor	E	13	ug/kg	
SD7	1	Pacific sanddab	liver	Zinc		23.6	mg/kg	0.58
SD7	1	Pacific sanddab	muscle	Zinc		3.32	mg/kg	0.58
SD7	2	Ca. scorpionfish	liver	Alpha (cis) Chlordane	E	4.4	ug/kg	
SD7	2	Ca. scorpionfish	muscle	Alpha (cis) Chlordane	E	0.4	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD7	2	Ca. scorpionfish	liver	Aluminum		8	mg/kg	2.6
SD7	2	Ca. scorpionfish	liver	Arsenic		3.6	mg/kg	1.4
SD7	2	Ca. scorpionfish	muscle	Arsenic		2.1	mg/kg	1.4
SD7	2	Ca. scorpionfish	liver	Cadmium		1.63	mg/kg	0.34
SD7	2	Ca. scorpionfish	liver	Cis Nonachlor	E	4.4	ug/kg	
SD7	2	Ca. scorpionfish	liver	Copper		55.7	mg/kg	0.76
SD7	2	Ca. scorpionfish	liver	Hexachlorobenzene	E	3.7	ug/kg	
SD7	2	Ca. scorpionfish	liver	Iron		127	mg/kg	1.3
SD7	2	Ca. scorpionfish	muscle	Iron		9.2	mg/kg	1.3
SD7	2	Ca. scorpionfish	liver	Lipids		25.1	%wt	0.005
SD7	2	Ca. scorpionfish	muscle	Lipids		2.78	%wt	0.005
SD7	2	Ca. scorpionfish	liver	Manganese		0.38	mg/kg	0.23
SD7	2	Ca. scorpionfish	liver	Mercury		0.083	mg/kg	0.03
SD7	2	Ca. scorpionfish	muscle	Mercury		0.351	mg/kg	0.03
SD7	2	Ca. scorpionfish	liver	o,p-DDE	E	6.1	ug/kg	
SD7	2	Ca. scorpionfish	muscle	o,p-DDE	E	0.8	ug/kg	
SD7	2	Ca. scorpionfish	liver	p,p-DDD	E	13	ug/kg	
SD7	2	Ca. scorpionfish	muscle	p,p-DDD	E	1.2	ug/kg	
SD7	2	Ca. scorpionfish	liver	p,p-DDE		1190	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	p,p-DDE		53	ug/kg	1.33
SD7	2	Ca. scorpionfish	liver	p,p-DDT	E	12	ug/kg	
SD7	2	Ca. scorpionfish	muscle	p,p-DDT	E	0.6	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 101		16	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	PCB 101	E	1.1	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 105	E	8.7	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 105	E	0.6	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 110	E	8.5	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 110	E	0.7	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 118		30	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	PCB 118		1.9	ug/kg	1.33
SD7	2	Ca. scorpionfish	liver	PCB 123	E	2.9	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 128	E	7.4	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 128	E	0.5	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 138		37	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	PCB 138		2.2	ug/kg	1.33
SD7	2	Ca. scorpionfish	liver	PCB 149	E	7	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 149	E	0.5	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 151	E	5.1	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 153/168		66	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	PCB 153/168		3.8	ug/kg	1.33
SD7	2	Ca. scorpionfish	liver	PCB 156	E	2.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 158	E	3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 167	E	1.8	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 170	E	11	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 170	E	0.6	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 177	E	3.9	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 177	E	0.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 180		27	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	PCB 180		1.4	ug/kg	1.33
SD7	2	Ca. scorpionfish	liver	PCB 183	E	7.3	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 183	E	0.4	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD7	2	Ca. scorpionfish	liver	PCB 187		23	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	PCB 187	E	1.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 194	E	6.1	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 194	E	0.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 206	E	4.5	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 206	E	0.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 49	E	3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 52	E	4.5	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 52	E	0.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 66	E	6.1	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 66	E	0.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 70	E	2.1	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 74	E	2.9	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 87	E	3.1	ug/kg	
SD7	2	Ca. scorpionfish	muscle	PCB 87	E	0.3	ug/kg	
SD7	2	Ca. scorpionfish	liver	PCB 99		16	ug/kg	13.3
SD7	2	Ca. scorpionfish	muscle	PCB 99	E	1	ug/kg	
SD7	2	Ca. scorpionfish	liver	Selenium		1.04	mg/kg	0.06
SD7	2	Ca. scorpionfish	muscle	Selenium		0.298	mg/kg	0.06
SD7	2	Ca. scorpionfish	liver	Total Solids		44.5	%wt	0.4
SD7	2	Ca. scorpionfish	muscle	Total Solids		23.4	%wt	0.4
SD7	2	Ca. scorpionfish	liver	Trans Nonachlor	E	12	ug/kg	
SD7	2	Ca. scorpionfish	muscle	Trans Nonachlor	E	0.9	ug/kg	
SD7	2	Ca. scorpionfish	liver	Zinc		112	mg/kg	0.58
SD7	2	Ca. scorpionfish	muscle	Zinc		3.85	mg/kg	0.58
SD7	3	Ca. scorpionfish	liver	Alpha (cis) Chlordane	E	3.3	ug/kg	
SD7	3	Ca. scorpionfish	muscle	Alpha (cis) Chlordane	E	0.4	ug/kg	
SD7	3	Ca. scorpionfish	liver	Aluminum		16	mg/kg	2.6
SD7	3	Ca. scorpionfish	liver	Arsenic		1.6	mg/kg	1.4
SD7	3	Ca. scorpionfish	muscle	Arsenic		4.2	mg/kg	1.4
SD7	3	Ca. scorpionfish	liver	Cadmium		1.45	mg/kg	0.34
SD7	3	Ca. scorpionfish	liver	Chromium		0.38	mg/kg	0.3
SD7	3	Ca. scorpionfish	liver	Copper		84.1	mg/kg	0.76
SD7	3	Ca. scorpionfish	muscle	Copper		22.2	mg/kg	0.76
SD7	3	Ca. scorpionfish	liver	Hexachlorobenzene	E	4.2	ug/kg	
SD7	3	Ca. scorpionfish	liver	Iron		104	mg/kg	1.3
SD7	3	Ca. scorpionfish	muscle	Iron		1.4	mg/kg	1.3
SD7	3	Ca. scorpionfish	liver	Lipids		26.8	%wt	0.005
SD7	3	Ca. scorpionfish	muscle	Lipids		3.58	%wt	0.005
SD7	3	Ca. scorpionfish	liver	Manganese		0.38	mg/kg	0.23
SD7	3	Ca. scorpionfish	liver	Mercury		0.068	mg/kg	0.03
SD7	3	Ca. scorpionfish	muscle	Mercury		0.25	mg/kg	0.03
SD7	3	Ca. scorpionfish	liver	o,p-DDE	E	3.4	ug/kg	
SD7	3	Ca. scorpionfish	muscle	o,p-DDE	E	0.8	ug/kg	
SD7	3	Ca. scorpionfish	liver	p,p-DDD	E	6.5	ug/kg	
SD7	3	Ca. scorpionfish	muscle	p,p-DDD	E	1	ug/kg	
SD7	3	Ca. scorpionfish	liver	p,p-DDE		520	ug/kg	13.3
SD7	3	Ca. scorpionfish	muscle	p,p-DDE		51	ug/kg	1.33
SD7	3	Ca. scorpionfish	liver	p,p-DDT	E	5.8	ug/kg	
SD7	3	Ca. scorpionfish	muscle	p,p-DDT	E	0.5	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 101	E	11	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD7	3	Ca. scorpionfish	muscle	PCB 101	E	0.8	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 105	E	6.8	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 105	E	0.4	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 110	E	5.1	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 110	E	0.4	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 118		21	ug/kg	13.3
SD7	3	Ca. scorpionfish	muscle	PCB 118		1.5	ug/kg	1.33
SD7	3	Ca. scorpionfish	liver	PCB 123	E	2.2	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 128	E	5.4	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 128	E	0.3	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 138		31	ug/kg	13.3
SD7	3	Ca. scorpionfish	muscle	PCB 138		1.8	ug/kg	1.33
SD7	3	Ca. scorpionfish	liver	PCB 149	E	6	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 149	E	0.3	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 151	E	3.5	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 153/168		68	ug/kg	13.3
SD7	3	Ca. scorpionfish	muscle	PCB 153/168		3.5	ug/kg	1.33
SD7	3	Ca. scorpionfish	liver	PCB 156	E	1.5	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 158	E	2	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 167	E	1.7	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 170	E	13	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 170	E	0.6	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 177	E	4.7	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 177	E	0.2	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 180		42	ug/kg	13.3
SD7	3	Ca. scorpionfish	muscle	PCB 180		1.6	ug/kg	1.33
SD7	3	Ca. scorpionfish	liver	PCB 183	E	11	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 183	E	0.4	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 187		37	ug/kg	13.3
SD7	3	Ca. scorpionfish	muscle	PCB 187		1.4	ug/kg	1.33
SD7	3	Ca. scorpionfish	liver	PCB 194		15	ug/kg	13.3
SD7	3	Ca. scorpionfish	muscle	PCB 194	E	0.4	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 201		20	ug/kg	13.3
SD7	3	Ca. scorpionfish	liver	PCB 206	E	7.1	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 206	E	0.3	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 52	E	2.7	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 52	E	0.2	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 66	E	3.6	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 66	E	0.2	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 70	E	1.6	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 74	E	1.7	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 87	E	1.8	ug/kg	
SD7	3	Ca. scorpionfish	liver	PCB 99	E	10	ug/kg	
SD7	3	Ca. scorpionfish	muscle	PCB 99	E	0.7	ug/kg	
SD7	3	Ca. scorpionfish	liver	Selenium		0.756	mg/kg	0.06
SD7	3	Ca. scorpionfish	muscle	Selenium		0.346	mg/kg	0.06
SD7	3	Ca. scorpionfish	liver	Total Solids		47.8	%wt	0.4
SD7	3	Ca. scorpionfish	muscle	Total Solids		22.9	%wt	0.4
SD7	3	Ca. scorpionfish	liver	Trans Nonachlor	E	9.1	ug/kg	
SD7	3	Ca. scorpionfish	muscle	Trans Nonachlor	E	0.7	ug/kg	
SD7	3	Ca. scorpionfish	liver	Zinc		103	mg/kg	0.58

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD7	3	Ca. scorpionfish	muscle	Zinc		5.45	mg/kg	0.58
SD8	1	Ca. scorpionfish	liver	Arsenic		2.2	mg/kg	1.4
SD8	1	Ca. scorpionfish	muscle	Arsenic		5.2	mg/kg	1.4
SD8	1	Ca. scorpionfish	liver	Cadmium		1.36	mg/kg	0.34
SD8	1	Ca. scorpionfish	liver	Chromium		0.5	mg/kg	0.3
SD8	1	Ca. scorpionfish	muscle	Chromium		0.44	mg/kg	0.3
SD8	1	Ca. scorpionfish	liver	Copper		32.1	mg/kg	0.76
SD8	1	Ca. scorpionfish	liver	Iron		141	mg/kg	1.3
SD8	1	Ca. scorpionfish	muscle	Iron		7.6	mg/kg	1.3
SD8	1	Ca. scorpionfish	liver	Lipids		31.4	%wt	0.005
SD8	1	Ca. scorpionfish	muscle	Lipids		2.5	%wt	0.005
SD8	1	Ca. scorpionfish	liver	Manganese		0.38	mg/kg	0.23
SD8	1	Ca. scorpionfish	liver	Mercury		0.087	mg/kg	0.03
SD8	1	Ca. scorpionfish	muscle	Mercury		0.205	mg/kg	0.03
SD8	1	Ca. scorpionfish	liver	o,p-DDE	E	3.7	ug/kg	
SD8	1	Ca. scorpionfish	liver	p,p-DDD	E	5.5	ug/kg	
SD8	1	Ca. scorpionfish	muscle	p,p-DDD	E	0.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	p,p-DDE		1050	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	p,p-DDE		27	ug/kg	1.33
SD8	1	Ca. scorpionfish	liver	p,p-DDT	E	9	ug/kg	
SD8	1	Ca. scorpionfish	muscle	p,p-DDT	E	0.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 101		15	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	PCB 101	E	0.4	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 105	E	8.4	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 105	E	0.3	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 110	E	7.2	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 110	E	0.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 118		36	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	PCB 118	E	1.1	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 123	E	2.7	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 128	E	12	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 138		60	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	PCB 138		1.5	ug/kg	1.33
SD8	1	Ca. scorpionfish	liver	PCB 149	E	6.3	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 149	E	0.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 151	E	6.7	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 151	E	0.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 153/168		110	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	PCB 153/168		2.7	ug/kg	1.33
SD8	1	Ca. scorpionfish	liver	PCB 156	E	5	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 158	E	5.1	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 167	E	3.9	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 170		19	ug/kg	13.3
SD8	1	Ca. scorpionfish	liver	PCB 177	E	8	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 177	E	0.1	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 180		39	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	PCB 180	E	1.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 183	E	13	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 183	E	0.3	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 187		37	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	PCB 187	E	0.9	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD8	1	Ca. scorpionfish	liver	PCB 194	E	12	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 194	E	0.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 201	E	12	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 206	E	6.4	ug/kg	
SD8	1	Ca. scorpionfish	muscle	PCB 206	E	0.2	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 52	E	2.8	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 66	E	4.1	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 70	E	0.9	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 74	E	1.9	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 87	E	2.6	ug/kg	
SD8	1	Ca. scorpionfish	liver	PCB 99		19	ug/kg	13.3
SD8	1	Ca. scorpionfish	muscle	PCB 99	E	0.5	ug/kg	
SD8	1	Ca. scorpionfish	liver	Selenium		0.632	mg/kg	0.06
SD8	1	Ca. scorpionfish	muscle	Selenium		0.313	mg/kg	0.06
SD8	1	Ca. scorpionfish	liver	Total Solids		52.8	%wt	0.4
SD8	1	Ca. scorpionfish	muscle	Total Solids		24.1	%wt	0.4
SD8	1	Ca. scorpionfish	liver	Trans Nonachlor	E	10	ug/kg	
SD8	1	Ca. scorpionfish	liver	Zinc		78.8	mg/kg	0.58
SD8	1	Ca. scorpionfish	muscle	Zinc		4.07	mg/kg	0.58
SD8	2	Pacific sanddab	liver	Alpha (cis) Chlordane	E	10	ug/kg	
SD8	2	Pacific sanddab	liver	Aluminum		6.1	mg/kg	2.6
SD8	2	Pacific sanddab	liver	Arsenic		1.6	mg/kg	1.4
SD8	2	Pacific sanddab	muscle	Arsenic		3.9	mg/kg	1.4
SD8	2	Pacific sanddab	liver	Cadmium		2.31	mg/kg	0.34
SD8	2	Pacific sanddab	liver	Copper		7.04	mg/kg	0.76
SD8	2	Pacific sanddab	muscle	Copper		1.03	mg/kg	0.76
SD8	2	Pacific sanddab	liver	Hexachlorobenzene	E	7.4	ug/kg	
SD8	2	Pacific sanddab	liver	Iron		88	mg/kg	1.3
SD8	2	Pacific sanddab	muscle	Iron		3.8	mg/kg	1.3
SD8	2	Pacific sanddab	liver	Lipids		36.2	%wt	0.005
SD8	2	Pacific sanddab	muscle	Lipids		0.37	%wt	0.005
SD8	2	Pacific sanddab	liver	Manganese		1.08	mg/kg	0.23
SD8	2	Pacific sanddab	muscle	Mercury		0.033	mg/kg	0.03
SD8	2	Pacific sanddab	liver	o,p-DDE	E	7.5	ug/kg	
SD8	2	Pacific sanddab	liver	o,p-DDT	E	2	ug/kg	
SD8	2	Pacific sanddab	liver	p,p-DDD	E	10	ug/kg	
SD8	2	Pacific sanddab	liver	p,p-DDE		520	ug/kg	13.3
SD8	2	Pacific sanddab	muscle	p,p-DDE		2.7	ug/kg	1.33
SD8	2	Pacific sanddab	liver	p,p-DDT		36	ug/kg	13.3
SD8	2	Pacific sanddab	liver	PCB 101		16	ug/kg	13.3
SD8	2	Pacific sanddab	liver	PCB 105	E	6.5	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 110	E	11	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 118		22	ug/kg	13.3
SD8	2	Pacific sanddab	muscle	PCB 118	E	0.2	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 123	E	1.8	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 128	E	4.5	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 138		26	ug/kg	13.3
SD8	2	Pacific sanddab	muscle	PCB 138	E	0.2	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 149	E	9.6	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 151	E	4.9	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 153/168		46	ug/kg	13.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD8	2	Pacific sanddab	muscle	PCB 153/168	E	0.5	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 156	E	1.3	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 158	E	1.6	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 167	E	1.5	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 170	E	5.7	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 177	E	3.4	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 180		14	ug/kg	13.3
SD8	2	Pacific sanddab	muscle	PCB 180	E	0.1	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 183	E	4.3	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 187		16	ug/kg	13.3
SD8	2	Pacific sanddab	liver	PCB 194	E	2.8	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 206	E	2.8	ug/kg	
SD8	2	Pacific sanddab	muscle	PCB 206	E	0.1	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 52	E	5.4	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 66	E	4.1	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 70	E	4.4	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 74	E	2.3	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 87	E	3.3	ug/kg	
SD8	2	Pacific sanddab	liver	PCB 99		14	ug/kg	13.3
SD8	2	Pacific sanddab	liver	Selenium		1.25	mg/kg	0.06
SD8	2	Pacific sanddab	muscle	Selenium		0.38	mg/kg	0.06
SD8	2	Pacific sanddab	liver	Total Solids		47.5	%wt	0.4
SD8	2	Pacific sanddab	muscle	Total Solids		19.8	%wt	0.4
SD8	2	Pacific sanddab	liver	Trans Nonachlor	E	12	ug/kg	
SD8	2	Pacific sanddab	liver	Zinc		25.6	mg/kg	0.58
SD8	2	Pacific sanddab	muscle	Zinc		3.58	mg/kg	0.58
SD8	3	Pacific sanddab	liver	Alpha (cis) Chlordane		19	ug/kg	13.3
SD8	3	Pacific sanddab	liver	Aluminum		12.8	mg/kg	2.6
SD8	3	Pacific sanddab	liver	Arsenic		1.7	mg/kg	1.4
SD8	3	Pacific sanddab	muscle	Arsenic		3	mg/kg	1.4
SD8	3	Pacific sanddab	liver	Chromium		0.4	mg/kg	0.3
SD8	3	Pacific sanddab	liver	Copper		1.24	mg/kg	0.76
SD8	3	Pacific sanddab	liver	Gamma (trans) Chlordane	E	7	ug/kg	
SD8	3	Pacific sanddab	liver	Hexachlorobenzene	E	6.1	ug/kg	
SD8	3	Pacific sanddab	liver	Iron		76.3	mg/kg	1.3
SD8	3	Pacific sanddab	muscle	Iron		4.9	mg/kg	1.3
SD8	3	Pacific sanddab	liver	Lead		2.7	mg/kg	2.5
SD8	3	Pacific sanddab	liver	Lipids		38.9	%wt	0.005
SD8	3	Pacific sanddab	muscle	Lipids		0.19	%wt	0.005
SD8	3	Pacific sanddab	liver	Manganese		0.72	mg/kg	0.23
SD8	3	Pacific sanddab	liver	Mercury		0.066	mg/kg	0.03
SD8	3	Pacific sanddab	liver	o,p-DDE		16	ug/kg	13.3
SD8	3	Pacific sanddab	liver	o,p-DDT	E	3.3	ug/kg	
SD8	3	Pacific sanddab	liver	p,p-DDD	E	9.9	ug/kg	
SD8	3	Pacific sanddab	liver	p,p-DDE		580	ug/kg	13.3
SD8	3	Pacific sanddab	muscle	p,p-DDE		2.1	ug/kg	1.33
SD8	3	Pacific sanddab	liver	p,p-DDT		52	ug/kg	13.3
SD8	3	Pacific sanddab	liver	PCB 101		20	ug/kg	13.3
SD8	3	Pacific sanddab	liver	PCB 105	E	11	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 110		22	ug/kg	13.3
SD8	3	Pacific sanddab	liver	PCB 118		44	ug/kg	13.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD8	3	Pacific sanddab	liver	PCB 123	E	3.9	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 128	E	9.6	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 138		53	ug/kg	13.3
SD8	3	Pacific sanddab	muscle	PCB 138	E	0.1	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 149	E	8	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 151	E	7.9	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 153/168		81	ug/kg	13.3
SD8	3	Pacific sanddab	muscle	PCB 153/168	E	0.2	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 156	E	3.3	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 158	E	3.5	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 167	E	2.7	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 170	E	12	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 177	E	3.8	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 180		24	ug/kg	13.3
SD8	3	Pacific sanddab	liver	PCB 183	E	6.7	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 187		25	ug/kg	13.3
SD8	3	Pacific sanddab	liver	PCB 194	E	5.8	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 201	E	8	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 206	E	4.6	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 52	E	6.8	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 66	E	4.3	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 70	E	5.4	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 74	E	3.2	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 87	E	4.6	ug/kg	
SD8	3	Pacific sanddab	liver	PCB 99		23	ug/kg	13.3
SD8	3	Pacific sanddab	liver	Selenium		1.03	mg/kg	0.06
SD8	3	Pacific sanddab	muscle	Selenium		0.323	mg/kg	0.06
SD8	3	Pacific sanddab	liver	Total Solids		58.2	%wt	0.4
SD8	3	Pacific sanddab	muscle	Total Solids		19.5	%wt	0.4
SD8	3	Pacific sanddab	liver	Trans Nonachlor	E	14	ug/kg	
SD8	3	Pacific sanddab	liver	Zinc		20.7	mg/kg	0.58
SD8	3	Pacific sanddab	muscle	Zinc		2.85	mg/kg	0.58
SD9	1	Longfin sanddab	liver	Alpha (cis) Chlordane	E	9.3	ug/kg	
SD9	1	Longfin sanddab	muscle	Aluminum		4	mg/kg	2.6
SD9	1	Longfin sanddab	liver	Arsenic		10	mg/kg	1.4
SD9	1	Longfin sanddab	muscle	Arsenic		9.9	mg/kg	1.4
SD9	1	Longfin sanddab	liver	Cadmium		5.29	mg/kg	0.34
SD9	1	Longfin sanddab	liver	Chromium		0.86	mg/kg	0.3
SD9	1	Longfin sanddab	liver	Cis Nonachlor	E	5.6	ug/kg	
SD9	1	Longfin sanddab	liver	Copper		10.9	mg/kg	0.76
SD9	1	Longfin sanddab	muscle	Copper		2.69	mg/kg	0.76
SD9	1	Longfin sanddab	liver	Hexachlorobenzene	E	3	ug/kg	
SD9	1	Longfin sanddab	liver	Iron		219	mg/kg	1.3
SD9	1	Longfin sanddab	muscle	Iron		5.4	mg/kg	1.3
SD9	1	Longfin sanddab	liver	Lipids		22.4	%wt	0.005
SD9	1	Longfin sanddab	muscle	Lipids		0.51	%wt	0.005
SD9	1	Longfin sanddab	liver	Manganese		1.84	mg/kg	0.23
SD9	1	Longfin sanddab	liver	Mercury		0.144	mg/kg	0.03
SD9	1	Longfin sanddab	muscle	Mercury		0.088	mg/kg	0.03
SD9	1	Longfin sanddab	liver	Mirex	E	2.5	ug/kg	
SD9	1	Longfin sanddab	liver	o,p-DDE		16	ug/kg	13.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD9	1	Longfin sanddab	liver	o,p-DDT	E	3.5	ug/kg	
SD9	1	Longfin sanddab	liver	p,p-DDD	E	8.2	ug/kg	
SD9	1	Longfin sanddab	liver	p,p-DDE		1000	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	p,p-DDE		7.6	ug/kg	1.33
SD9	1	Longfin sanddab	liver	p,p-DDT		38	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	p,p-DDT	E	0.3	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 101		18	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 101	E	0.2	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 105		16	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 105	E	0.1	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 110		22	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 110	E	0.2	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 118		51	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 118	E	0.5	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 123	E	5.9	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 128		20	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 128	E	0.2	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 138		110	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 138	E	1.1	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 149		19	ug/kg	13.3
SD9	1	Longfin sanddab	liver	PCB 151		16	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 151	E	0.1	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 153/168		170	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 153/168		1.7	ug/kg	1.33
SD9	1	Longfin sanddab	liver	PCB 156	E	7.5	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 158	E	7.9	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 167	E	4.6	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 170		28	ug/kg	13.3
SD9	1	Longfin sanddab	liver	PCB 177	E	13	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 180		55	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 180	E	0.7	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 183		19	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 183	E	0.2	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 187		58	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 187	E	0.5	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 194		22	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 194	E	0.1	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 201		22	ug/kg	13.3
SD9	1	Longfin sanddab	liver	PCB 206	E	12	ug/kg	
SD9	1	Longfin sanddab	muscle	PCB 206	E	0.2	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 52	E	4.9	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 66	E	6.2	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 70	E	2.2	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 74	E	3	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 87	E	2.8	ug/kg	
SD9	1	Longfin sanddab	liver	PCB 99		36	ug/kg	13.3
SD9	1	Longfin sanddab	muscle	PCB 99	E	0.3	ug/kg	
SD9	1	Longfin sanddab	liver	Selenium		3.33	mg/kg	0.06
SD9	1	Longfin sanddab	muscle	Selenium		1.42	mg/kg	0.06
SD9	1	Longfin sanddab	liver	Total Solids		31.4	%wt	0.4
SD9	1	Longfin sanddab	muscle	Total Solids		18.6	%wt	0.4

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD9	1	Longfin sanddab	liver	Trans Nonachlor	E	1.2	ug/kg	
SD9	1	Longfin sanddab	liver	Zinc		31.6	mg/kg	0.58
SD9	1	Longfin sanddab	muscle	Zinc		3.12	mg/kg	0.58
SD9	2	Pacific sanddab	liver	Alpha (cis) Chlordane	E	12	ug/kg	
SD9	2	Pacific sanddab	liver	Aluminum		6.1	mg/kg	2.6
SD9	2	Pacific sanddab	liver	Arsenic		1.6	mg/kg	1.4
SD9	2	Pacific sanddab	muscle	Arsenic		3.1	mg/kg	1.4
SD9	2	Pacific sanddab	liver	Cadmium		1.74	mg/kg	0.34
SD9	2	Pacific sanddab	liver	Chromium		0.5	mg/kg	0.3
SD9	2	Pacific sanddab	liver	Copper		4.88	mg/kg	0.76
SD9	2	Pacific sanddab	liver	Hexachlorobenzene	E	6.2	ug/kg	
SD9	2	Pacific sanddab	liver	Iron		61.9	mg/kg	1.3
SD9	2	Pacific sanddab	liver	Lipids		38.9	%wt	0.005
SD9	2	Pacific sanddab	muscle	Lipids		0.51	%wt	0.005
SD9	2	Pacific sanddab	liver	Manganese		1.28	mg/kg	0.23
SD9	2	Pacific sanddab	muscle	Mercury		0.096	mg/kg	0.03
SD9	2	Pacific sanddab	liver	o,p-DDE		22	ug/kg	13.3
SD9	2	Pacific sanddab	liver	o,p-DDT	E	3.3	ug/kg	
SD9	2	Pacific sanddab	liver	p,p-DDD	E	10	ug/kg	
SD9	2	Pacific sanddab	liver	p,p-DDE		540	ug/kg	13.3
SD9	2	Pacific sanddab	muscle	p,p-DDE	E	0.6	ug/kg	
SD9	2	Pacific sanddab	liver	p,p-DDT		40	ug/kg	13.3
SD9	2	Pacific sanddab	liver	PCB 101	E	12	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 105	E	5.3	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 110	E	9.9	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 118		16	ug/kg	13.3
SD9	2	Pacific sanddab	liver	PCB 123	E	2.1	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 128	E	4	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 138		22	ug/kg	13.3
SD9	2	Pacific sanddab	liver	PCB 149	E	8.1	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 151	E	4.1	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 153/168		39	ug/kg	13.3
SD9	2	Pacific sanddab	liver	PCB 156	E	0.8	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 158	E	1.5	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 167	E	1.2	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 170	E	6	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 177	E	2	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 180	E	13	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 183	E	3.8	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 187		14	ug/kg	13.3
SD9	2	Pacific sanddab	liver	PCB 194	E	2.6	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 206	E	2.9	ug/kg	
SD9	2	Pacific sanddab	muscle	PCB 206	E	0.2	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 52	E	4.6	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 66	E	4.1	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 70	E	4.9	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 74	E	2.6	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 87	E	2.6	ug/kg	
SD9	2	Pacific sanddab	liver	PCB 99	E	11	ug/kg	
SD9	2	Pacific sanddab	liver	Selenium		1.13	mg/kg	0.06
SD9	2	Pacific sanddab	muscle	Selenium		0.394	mg/kg	0.06

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD9	2	Pacific sanddab	liver	Total Solids		51.6	%wt	0.4
SD9	2	Pacific sanddab	muscle	Total Solids		19	%wt	0.4
SD9	2	Pacific sanddab	liver	Trans Nonachlor	E	13	ug/kg	
SD9	2	Pacific sanddab	liver	Zinc		28.6	mg/kg	0.58
SD9	2	Pacific sanddab	muscle	Zinc		3.1	mg/kg	0.58
SD9	3	Longfin sanddab	liver	Alpha (cis) Chlordane	E	13	ug/kg	
SD9	3	Longfin sanddab	liver	Aluminum		6.4	mg/kg	2.6
SD9	3	Longfin sanddab	liver	Arsenic		8.8	mg/kg	1.4
SD9	3	Longfin sanddab	muscle	Arsenic		9.2	mg/kg	1.4
SD9	3	Longfin sanddab	liver	BHC, Delta isomer		25	ug/kg	20
SD9	3	Longfin sanddab	liver	Cadmium		2.57	mg/kg	0.34
SD9	3	Longfin sanddab	liver	Copper		8.56	mg/kg	0.76
SD9	3	Longfin sanddab	liver	Gamma (trans) Chlordane	E	4.9	ug/kg	
SD9	3	Longfin sanddab	liver	Iron		182	mg/kg	1.3
SD9	3	Longfin sanddab	liver	Lipids		22.7	%wt	0.005
SD9	3	Longfin sanddab	muscle	Lipids		0.25	%wt	0.005
SD9	3	Longfin sanddab	liver	Manganese		1.15	mg/kg	0.23
SD9	3	Longfin sanddab	liver	Mercury		0.044	mg/kg	0.03
SD9	3	Longfin sanddab	muscle	Mercury		0.063	mg/kg	0.03
SD9	3	Longfin sanddab	liver	Mirex	E	4	ug/kg	
SD9	3	Longfin sanddab	liver	o,p-DDD	E	3.7	ug/kg	
SD9	3	Longfin sanddab	liver	o,p-DDE		20	ug/kg	13.3
SD9	3	Longfin sanddab	liver	o,p-DDT	E	2.4	ug/kg	
SD9	3	Longfin sanddab	liver	p,p-DDD		16	ug/kg	13.3
SD9	3	Longfin sanddab	liver	p,p-DDE		1280	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	p,p-DDE		5.1	ug/kg	1.33
SD9	3	Longfin sanddab	liver	p,p-DDT		54	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 101		25	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 105		23	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 105	E	0.1	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 110		27	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 110	E	0.1	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 118		74	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 118	E	0.4	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 123	E	8	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 128		31	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 138		160	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 138	E	0.7	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 149		26	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 151		21	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 153/168		250	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 153/168	E	1.1	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 156	E	12	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 158	E	11	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 167	E	7.3	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 170		40	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 177		15	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 180		80	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 180	E	0.4	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 183		30	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 183	E	0.1	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD9	3	Longfin sanddab	liver	PCB 187		84	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 187	E	0.3	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 194		30	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 201		30	ug/kg	13.3
SD9	3	Longfin sanddab	liver	PCB 206		19	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 206	E	0.1	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 52	E	6.1	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 66	E	7.4	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 70	E	3.4	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 74	E	3.6	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 87	E	4.1	ug/kg	
SD9	3	Longfin sanddab	liver	PCB 99		44	ug/kg	13.3
SD9	3	Longfin sanddab	muscle	PCB 99	E	0.3	ug/kg	
SD9	3	Longfin sanddab	liver	Selenium		3.61	mg/kg	0.06
SD9	3	Longfin sanddab	muscle	Selenium		2.19	mg/kg	0.06
SD9	3	Longfin sanddab	liver	Total Solids		37.5	%wt	0.4
SD9	3	Longfin sanddab	muscle	Total Solids		19.2	%wt	0.4
SD9	3	Longfin sanddab	liver	Trans Nonachlor	E	18	ug/kg	
SD9	3	Longfin sanddab	liver	Zinc		26	mg/kg	0.58
SD9	3	Longfin sanddab	muscle	Zinc		2.59	mg/kg	0.58
SD10	1	Ca. scorpionfish	liver	Aluminum		11.2	mg/kg	2.6
SD10	1	Ca. scorpionfish	muscle	Aluminum		3.7	mg/kg	2.6
SD10	1	Ca. scorpionfish	liver	Arsenic		1.5	mg/kg	1.4
SD10	1	Ca. scorpionfish	muscle	Arsenic		4.8	mg/kg	1.4
SD10	1	Ca. scorpionfish	liver	BHC, Delta isomer	E	6.9	ug/kg	
SD10	1	Ca. scorpionfish	liver	Cadmium		4.73	mg/kg	0.34
SD10	1	Ca. scorpionfish	liver	Chromium		0.37	mg/kg	0.3
SD10	1	Ca. scorpionfish	muscle	Chromium		0.38	mg/kg	0.3
SD10	1	Ca. scorpionfish	liver	Copper		60	mg/kg	0.76
SD10	1	Ca. scorpionfish	muscle	Copper		2.8	mg/kg	0.76
SD10	1	Ca. scorpionfish	liver	Iron		164	mg/kg	1.3
SD10	1	Ca. scorpionfish	muscle	Iron		12.2	mg/kg	1.3
SD10	1	Ca. scorpionfish	liver	Lipids		16.5	%wt	0.005
SD10	1	Ca. scorpionfish	muscle	Lipids		0.52	%wt	0.005
SD10	1	Ca. scorpionfish	liver	Manganese		0.56	mg/kg	0.23
SD10	1	Ca. scorpionfish	liver	Mercury		0.132	mg/kg	0.03
SD10	1	Ca. scorpionfish	muscle	Mercury		0.344	mg/kg	0.03
SD10	1	Ca. scorpionfish	liver	p,p-DDD	E	5.4	ug/kg	
SD10	1	Ca. scorpionfish	liver	p,p-DDE		460	ug/kg	13.3
SD10	1	Ca. scorpionfish	muscle	p,p-DDE		8.7	ug/kg	1.33
SD10	1	Ca. scorpionfish	liver	p,p-DDT	E	5.6	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 101	E	12	ug/kg	
SD10	1	Ca. scorpionfish	muscle	PCB 101	E	0.2	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 105	E	9.2	ug/kg	
SD10	1	Ca. scorpionfish	muscle	PCB 105	E	0.2	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 110	E	7.6	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 118		31	ug/kg	13.3
SD10	1	Ca. scorpionfish	muscle	PCB 118	E	0.6	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 123	E	3	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 128	E	9.6	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 138		53	ug/kg	13.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD10	1	Ca. scorpionfish	muscle	PCB 138	E	0.7	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 149	E	4.7	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 151	E	6	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 153/168		97	ug/kg	13.3
SD10	1	Ca. scorpionfish	muscle	PCB 153/168	E	1.2	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 156	E	4	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 158	E	5.4	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 167	E	3.1	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 170		17	ug/kg	13.3
SD10	1	Ca. scorpionfish	liver	PCB 177	E	7	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 180		37	ug/kg	13.3
SD10	1	Ca. scorpionfish	muscle	PCB 180	E	0.5	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 183	E	12	ug/kg	
SD10	1	Ca. scorpionfish	muscle	PCB 183	E	0.1	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 187		35	ug/kg	13.3
SD10	1	Ca. scorpionfish	muscle	PCB 187	E	0.3	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 194	E	10	ug/kg	
SD10	1	Ca. scorpionfish	muscle	PCB 194	E	0.1	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 206	E	6.3	ug/kg	
SD10	1	Ca. scorpionfish	muscle	PCB 206	E	0.2	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 52	E	2.7	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 66	E	4.3	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 74	E	2.2	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 87	E	2.3	ug/kg	
SD10	1	Ca. scorpionfish	liver	PCB 99		16	ug/kg	13.3
SD10	1	Ca. scorpionfish	liver	Selenium		0.918	mg/kg	0.06
SD10	1	Ca. scorpionfish	muscle	Selenium		0.528	mg/kg	0.06
SD10	1	Ca. scorpionfish	liver	Total Solids		38	%wt	0.4
SD10	1	Ca. scorpionfish	muscle	Total Solids		21.2	%wt	0.4
SD10	1	Ca. scorpionfish	liver	Trans Nonachlor	E	6.7	ug/kg	
SD10	1	Ca. scorpionfish	liver	Zinc		135	mg/kg	0.58
SD10	1	Ca. scorpionfish	muscle	Zinc		3.13	mg/kg	0.58
SD10	2	Ca. scorpionfish	liver	Aluminum		17.3	mg/kg	2.6
SD10	2	Ca. scorpionfish	liver	Arsenic		1.7	mg/kg	1.4
SD10	2	Ca. scorpionfish	muscle	Arsenic		3.7	mg/kg	1.4
SD10	2	Ca. scorpionfish	liver	Cadmium		1.68	mg/kg	0.34
SD10	2	Ca. scorpionfish	liver	Chromium		0.44	mg/kg	0.3
SD10	2	Ca. scorpionfish	liver	Copper		41.3	mg/kg	0.76
SD10	2	Ca. scorpionfish	muscle	Copper		4.11	mg/kg	0.76
SD10	2	Ca. scorpionfish	liver	Hexachlorobenzene	E	4.5	ug/kg	
SD10	2	Ca. scorpionfish	liver	Iron		123	mg/kg	1.3
SD10	2	Ca. scorpionfish	muscle	Iron		5.8	mg/kg	1.3
SD10	2	Ca. scorpionfish	liver	Lipids		25.7	%wt	0.005
SD10	2	Ca. scorpionfish	muscle	Lipids		0.76	%wt	0.005
SD10	2	Ca. scorpionfish	liver	Manganese		0.73	mg/kg	0.23
SD10	2	Ca. scorpionfish	liver	Mercury		0.131	mg/kg	0.03
SD10	2	Ca. scorpionfish	muscle	Mercury		0.244	mg/kg	0.03
SD10	2	Ca. scorpionfish	liver	o,p-DDE	E	3.3	ug/kg	
SD10	2	Ca. scorpionfish	liver	p,p-DDD	E	7.1	ug/kg	
SD10	2	Ca. scorpionfish	liver	p,p-DDE		710	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	p,p-DDE		6.9	ug/kg	1.33

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD10	2	Ca. scorpionfish	liver	p,p-DDT	E	10	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 101		20	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	PCB 101	E	0.2	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 105	E	11	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 110		16	ug/kg	13.3
SD10	2	Ca. scorpionfish	liver	PCB 118		40	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	PCB 118	E	0.4	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 123	E	4.4	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 128	E	12	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 138		68	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	PCB 138	E	0.5	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 149	E	9.2	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 151	E	7.7	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 153/168		110	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	PCB 153/168	E	0.9	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 156	E	4.1	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 158	E	5.3	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 167	E	2.9	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 170		23	ug/kg	13.3
SD10	2	Ca. scorpionfish	liver	PCB 177	E	9.5	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 180		44	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	PCB 180	E	0.4	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 183		14	ug/kg	13.3
SD10	2	Ca. scorpionfish	liver	PCB 187		40	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	PCB 187	E	0.2	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 194		15	ug/kg	13.3
SD10	2	Ca. scorpionfish	liver	PCB 201		18	ug/kg	13.3
SD10	2	Ca. scorpionfish	liver	PCB 206	E	7.6	ug/kg	
SD10	2	Ca. scorpionfish	muscle	PCB 206	E	0.1	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 52	E	4.8	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 66	E	5.8	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 70	E	2.7	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 74	E	2.8	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 87	E	4.4	ug/kg	
SD10	2	Ca. scorpionfish	liver	PCB 99		23	ug/kg	13.3
SD10	2	Ca. scorpionfish	muscle	PCB 99	E	0.2	ug/kg	
SD10	2	Ca. scorpionfish	liver	Selenium		0.923	mg/kg	0.06
SD10	2	Ca. scorpionfish	muscle	Selenium		0.487	mg/kg	0.06
SD10	2	Ca. scorpionfish	liver	Total Solids		45.7	%wt	0.4
SD10	2	Ca. scorpionfish	muscle	Total Solids		20.4	%wt	0.4
SD10	2	Ca. scorpionfish	liver	Trans Nonachlor	E	12	ug/kg	
SD10	2	Ca. scorpionfish	liver	Zinc		87.3	mg/kg	0.58
SD10	2	Ca. scorpionfish	muscle	Zinc		3.18	mg/kg	0.58
SD10	3	Ca. scorpionfish	liver	Alpha (cis) Chlordane	E	5	ug/kg	
SD10	3	Ca. scorpionfish	liver	Aluminum		6.1	mg/kg	2.6
SD10	3	Ca. scorpionfish	muscle	Aluminum		6	mg/kg	2.6
SD10	3	Ca. scorpionfish	muscle	Arsenic		3.2	mg/kg	1.4
SD10	3	Ca. scorpionfish	liver	Cadmium		4.52	mg/kg	0.34
SD10	3	Ca. scorpionfish	liver	Copper		59.1	mg/kg	0.76
SD10	3	Ca. scorpionfish	muscle	Copper		2.69	mg/kg	0.76
SD10	3	Ca. scorpionfish	liver	Iron		117	mg/kg	1.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD10	3	Ca. scorpionfish	muscle	Iron		13.9	mg/kg	1.3
SD10	3	Ca. scorpionfish	liver	Lipids		18.4	%wt	0.005
SD10	3	Ca. scorpionfish	muscle	Lipids		3.72	%wt	0.005
SD10	3	Ca. scorpionfish	liver	Manganese		0.47	mg/kg	0.23
SD10	3	Ca. scorpionfish	liver	Mercury		0.222	mg/kg	0.03
SD10	3	Ca. scorpionfish	muscle	Mercury		0.348	mg/kg	0.03
SD10	3	Ca. scorpionfish	liver	o,p-DDE		67.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	o,p-DDE		3.1	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	p,p-DDD		18.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	p,p-DDD	E	0.9	ug/kg	
SD10	3	Ca. scorpionfish	liver	p,p-DDE		3240	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	p,p-DDE		140	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	p,p-DDT		20	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	p,p-DDT	E	0.6	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 101		31	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 101		1.6	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	PCB 105		17.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 105	E	0.8	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 110	E	12	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 110	E	0.9	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 118		55.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 118		3.1	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	PCB 123	E	5.45	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 123	E	0.3	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 128	E	13.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 128	E	0.8	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 138		81	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 138		3.8	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	PCB 149	E	9.5	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 149	E	0.3	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 151	E	9.25	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 151	E	0.5	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 153/168		130	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 153/168		6.5	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	PCB 156	E	5.3	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 156	E	0.3	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 158	E	6.15	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 158	E	0.3	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 167	E	3.05	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 167	E	0.2	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 170		25	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 170	E	1.2	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 177	E	6.9	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 177	E	0.4	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 180		47.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 180		2.8	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	PCB 183		15	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 183	E	0.8	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 187		39	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 187		2.2	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	PCB 194	E	12.5	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD10	3	Ca. scorpionfish	muscle	PCB 194	E	0.5	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 206	E	7.45	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 206	E	0.3	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 52	E	7.55	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 52	E	0.5	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 66	E	13.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 66	E	0.6	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 70	E	4.9	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 74	E	7.15	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 74	E	0.3	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 87	E	5.35	ug/kg	
SD10	3	Ca. scorpionfish	muscle	PCB 87	E	0.3	ug/kg	
SD10	3	Ca. scorpionfish	liver	PCB 99		29.5	ug/kg	13.3
SD10	3	Ca. scorpionfish	muscle	PCB 99		1.5	ug/kg	1.33
SD10	3	Ca. scorpionfish	liver	Selenium		0.783	mg/kg	0.06
SD10	3	Ca. scorpionfish	muscle	Selenium		0.494	mg/kg	0.06
SD10	3	Ca. scorpionfish	liver	Total Solids		47.8	%wt	0.4
SD10	3	Ca. scorpionfish	muscle	Total Solids		21.4	%wt	0.4
SD10	3	Ca. scorpionfish	liver	Trans Nonachlor	E	14.5	ug/kg	
SD10	3	Ca. scorpionfish	muscle	Trans Nonachlor	E	0.7	ug/kg	
SD10	3	Ca. scorpionfish	liver	Zinc		137	mg/kg	0.58
SD10	3	Ca. scorpionfish	muscle	Zinc		4.61	mg/kg	0.58
SD11	1	Longfin sanddab	liver	Alpha (cis) Chlordane	E	6.7	ug/kg	
SD11	1	Longfin sanddab	liver	Arsenic		10.5	mg/kg	1.4
SD11	1	Longfin sanddab	muscle	Arsenic		8.7	mg/kg	1.4
SD11	1	Longfin sanddab	liver	Cadmium		2.33	mg/kg	0.34
SD11	1	Longfin sanddab	liver	Copper		4.58	mg/kg	0.76
SD11	1	Longfin sanddab	liver	Iron		200	mg/kg	1.3
SD11	1	Longfin sanddab	muscle	Iron		3	mg/kg	1.3
SD11	1	Longfin sanddab	liver	Lipids		14.9	%wt	0.005
SD11	1	Longfin sanddab	muscle	Lipids		0.27	%wt	0.005
SD11	1	Longfin sanddab	liver	Manganese		1.23	mg/kg	0.23
SD11	1	Longfin sanddab	liver	Mercury		0.065	mg/kg	0.03
SD11	1	Longfin sanddab	muscle	Mercury		0.086	mg/kg	0.03
SD11	1	Longfin sanddab	liver	o,p-DDE	E	12	ug/kg	
SD11	1	Longfin sanddab	liver	o,p-DDT	E	1.6	ug/kg	
SD11	1	Longfin sanddab	liver	p,p-DDD	E	6.7	ug/kg	
SD11	1	Longfin sanddab	liver	p,p-DDE		1020	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	p,p-DDE		5	ug/kg	1.33
SD11	1	Longfin sanddab	liver	p,p-DDT		30	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 101	E	12	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 105		15	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 110		15	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 118		54	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	PCB 118	E	0.4	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 123	E	5.6	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 128		22	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 138		110	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	PCB 138	E	0.6	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 149	E	12	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 151		15	ug/kg	13.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD11	1	Longfin sanddab	liver	PCB 153/168		190	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	PCB 153/168	E	0.9	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 156	E	9.3	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 157	E	2.8	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 158	E	7.8	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 167	E	5.5	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 170		36	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 177		14	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 180		71	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	PCB 180	E	0.4	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 183		26	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 187		74	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	PCB 187	E	0.3	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 194		29	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 201		28	ug/kg	13.3
SD11	1	Longfin sanddab	liver	PCB 206		17	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	PCB 206	E	0.1	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 52	E	3.5	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 66	E	4	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 70	E	1.5	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 74	E	3.2	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 87	E	2	ug/kg	
SD11	1	Longfin sanddab	liver	PCB 99		34	ug/kg	13.3
SD11	1	Longfin sanddab	muscle	PCB 99	E	0.2	ug/kg	
SD11	1	Longfin sanddab	liver	Selenium		3.88	mg/kg	0.06
SD11	1	Longfin sanddab	muscle	Selenium		2	mg/kg	0.06
SD11	1	Longfin sanddab	liver	Total Solids		40.4	%wt	0.4
SD11	1	Longfin sanddab	muscle	Total Solids		19	%wt	0.4
SD11	1	Longfin sanddab	liver	Trans Nonachlor	E	14	ug/kg	
SD11	1	Longfin sanddab	liver	Zinc		22.7	mg/kg	0.58
SD11	1	Longfin sanddab	muscle	Zinc		2.75	mg/kg	0.58
SD11	2	Ca. scorpionfish	liver	Alpha (cis) Chlordane	E	4.9	ug/kg	
SD11	2	Ca. scorpionfish	liver	Aluminum		10.4	mg/kg	2.6
SD11	2	Ca. scorpionfish	muscle	Arsenic		1.7	mg/kg	1.4
SD11	2	Ca. scorpionfish	liver	Cadmium		3.19	mg/kg	0.34
SD11	2	Ca. scorpionfish	liver	Copper		30.5	mg/kg	0.76
SD11	2	Ca. scorpionfish	liver	Hexachlorobenzene	E	4.3	ug/kg	
SD11	2	Ca. scorpionfish	liver	Iron		137	mg/kg	1.3
SD11	2	Ca. scorpionfish	muscle	Iron		5.7	mg/kg	1.3
SD11	2	Ca. scorpionfish	liver	Lipids		24.8	%wt	0.005
SD11	2	Ca. scorpionfish	muscle	Lipids		0.22	%wt	0.005
SD11	2	Ca. scorpionfish	liver	Mercury		0.218	mg/kg	0.03
SD11	2	Ca. scorpionfish	muscle	Mercury		0.266	mg/kg	0.03
SD11	2	Ca. scorpionfish	liver	o,p-DDE	E	3.8	ug/kg	
SD11	2	Ca. scorpionfish	liver	p,p-DDD	E	9.1	ug/kg	
SD11	2	Ca. scorpionfish	liver	p,p-DDE		1220	ug/kg	13.3
SD11	2	Ca. scorpionfish	muscle	p,p-DDE		12	ug/kg	1.33
SD11	2	Ca. scorpionfish	liver	p,p-DDT	E	11	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 101	E	13	ug/kg	
SD11	2	Ca. scorpionfish	muscle	PCB 101	E	0.1	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 105	E	6.9	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD11	2	Ca. scorpionfish	liver	PCB 110	E	7.3	ug/kg	
SD11	2	Ca. scorpionfish	muscle	PCB 110	E	0.1	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 118		22	ug/kg	13.3
SD11	2	Ca. scorpionfish	muscle	PCB 118	E	0.3	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 123	E	2.3	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 128	E	5.6	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 138		28	ug/kg	13.3
SD11	2	Ca. scorpionfish	muscle	PCB 138	E	0.3	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 149	E	5.8	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 151	E	3.7	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 153/168		50	ug/kg	13.3
SD11	2	Ca. scorpionfish	muscle	PCB 153/168	E	0.7	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 156	E	1.1	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 158	E	2	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 167	E	1.5	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 177	E	2.7	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 180		21	ug/kg	13.3
SD11	2	Ca. scorpionfish	muscle	PCB 180	E	0.2	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 183	E	5.9	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 187		18	ug/kg	13.3
SD11	2	Ca. scorpionfish	liver	PCB 194	E	5.8	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 206	E	4	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 66	E	4.4	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 70	E	1.3	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 74	E	2	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 87	E	2.3	ug/kg	
SD11	2	Ca. scorpionfish	liver	PCB 99	E	11	ug/kg	
SD11	2	Ca. scorpionfish	muscle	PCB 99	E	0.2	ug/kg	
SD11	2	Ca. scorpionfish	liver	Selenium		0.918	mg/kg	0.06
SD11	2	Ca. scorpionfish	muscle	Selenium		0.393	mg/kg	0.06
SD11	2	Ca. scorpionfish	liver	Total Solids		45.3	%wt	0.4
SD11	2	Ca. scorpionfish	muscle	Total Solids		21.1	%wt	0.4
SD11	2	Ca. scorpionfish	liver	Trans Nonachlor	E	12	ug/kg	
SD11	2	Ca. scorpionfish	liver	Zinc		92	mg/kg	0.58
SD11	2	Ca. scorpionfish	muscle	Zinc		3.27	mg/kg	0.58
SD11	3	Ca. scorpionfish	liver	Arsenic		1.6	mg/kg	1.4
SD11	3	Ca. scorpionfish	muscle	Arsenic		6.2	mg/kg	1.4
SD11	3	Ca. scorpionfish	liver	Cadmium		2.88	mg/kg	0.34
SD11	3	Ca. scorpionfish	liver	Copper		31.7	mg/kg	0.76
SD11	3	Ca. scorpionfish	muscle	Copper		1.46	mg/kg	0.76
SD11	3	Ca. scorpionfish	liver	Dieldrin		36	ug/kg	20
SD11	3	Ca. scorpionfish	liver	Endrin	E	10	ug/kg	
SD11	3	Ca. scorpionfish	liver	Heptachlor	E	2.5	ug/kg	
SD11	3	Ca. scorpionfish	liver	Iron		128	mg/kg	1.3
SD11	3	Ca. scorpionfish	muscle	Iron		2.8	mg/kg	1.3
SD11	3	Ca. scorpionfish	liver	Lipids		24.4	%wt	0.005
SD11	3	Ca. scorpionfish	muscle	Lipids		1.36	%wt	0.005
SD11	3	Ca. scorpionfish	liver	Mercury		0.102	mg/kg	0.03
SD11	3	Ca. scorpionfish	muscle	Mercury		0.271	mg/kg	0.03
SD11	3	Ca. scorpionfish	liver	o,p-DDE	E	2.6	ug/kg	
SD11	3	Ca. scorpionfish	liver	p,p-DDD	E	6.9	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD11	3	Ca. scorpionfish	muscle	p,p-DDD	E	0.3	ug/kg	
SD11	3	Ca. scorpionfish	liver	p,p-DDE		530	ug/kg	13.3
SD11	3	Ca. scorpionfish	muscle	p,p-DDE		14	ug/kg	1.33
SD11	3	Ca. scorpionfish	liver	p,p-DDT	E	7.2	ug/kg	
SD11	3	Ca. scorpionfish	muscle	p,p-DDT	E	0.3	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 101	E	13	ug/kg	
SD11	3	Ca. scorpionfish	muscle	PCB 101	E	0.3	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 105	E	7.1	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 110	E	8	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 118		27	ug/kg	13.3
SD11	3	Ca. scorpionfish	muscle	PCB 118	E	0.4	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 123	E	2.4	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 128	E	7.8	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 138		42	ug/kg	13.3
SD11	3	Ca. scorpionfish	muscle	PCB 138	E	0.5	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 149	E	9.1	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 151	E	6.4	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 153/168		80	ug/kg	13.3
SD11	3	Ca. scorpionfish	muscle	PCB 153/168	E	1	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 156	E	2.7	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 158	E	3.3	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 167	E	1.9	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 170		17	ug/kg	13.3
SD11	3	Ca. scorpionfish	liver	PCB 177	E	7	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 180		33	ug/kg	13.3
SD11	3	Ca. scorpionfish	muscle	PCB 180	E	0.4	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 183	E	11	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 187		33	ug/kg	13.3
SD11	3	Ca. scorpionfish	muscle	PCB 187	E	0.2	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 194	E	11	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 206	E	5.4	ug/kg	
SD11	3	Ca. scorpionfish	muscle	PCB 206	E	0.1	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 52	E	3	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 66	E	4.6	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 70	E	1.7	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 74	E	2	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 87	E	2.3	ug/kg	
SD11	3	Ca. scorpionfish	liver	PCB 99		14	ug/kg	13.3
SD11	3	Ca. scorpionfish	muscle	PCB 99	E	0.2	ug/kg	
SD11	3	Ca. scorpionfish	liver	Selenium		0.883	mg/kg	0.06
SD11	3	Ca. scorpionfish	muscle	Selenium		0.434	mg/kg	0.06
SD11	3	Ca. scorpionfish	liver	Total Solids		42.1	%wt	0.4
SD11	3	Ca. scorpionfish	muscle	Total Solids		21.7	%wt	0.4
SD11	3	Ca. scorpionfish	liver	Trans Nonachlor	E	9.5	ug/kg	
SD11	3	Ca. scorpionfish	muscle	Trans Nonachlor	E	0.3	ug/kg	
SD11	3	Ca. scorpionfish	liver	Zinc		123	mg/kg	0.58
SD11	3	Ca. scorpionfish	muscle	Zinc		3.06	mg/kg	0.58
SD12	1	Pacific sanddab	liver	Alpha (cis) Chlordane		31	ug/kg	13.3
SD12	1	Pacific sanddab	liver	Aluminum		7.9	mg/kg	2.6
SD12	1	Pacific sanddab	muscle	Aluminum		3.6	mg/kg	2.6
SD12	1	Pacific sanddab	liver	Arsenic		2.1	mg/kg	1.4

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD12	1	Pacific sanddab	muscle	Arsenic		4.9	mg/kg	1.4
SD12	1	Pacific sanddab	liver	BHC, Alpha isomer	E	12	ug/kg	
SD12	1	Pacific sanddab	liver	Cadmium		3.84	mg/kg	0.34
SD12	1	Pacific sanddab	liver	Copper		16.5	mg/kg	0.76
SD12	1	Pacific sanddab	muscle	Copper		1.96	mg/kg	0.76
SD12	1	Pacific sanddab	liver	Dieldrin		93	ug/kg	20
SD12	1	Pacific sanddab	liver	Endrin		90	ug/kg	20
SD12	1	Pacific sanddab	liver	Gamma (trans) Chlordane		21	ug/kg	13.3
SD12	1	Pacific sanddab	liver	Hexachlorobenzene	E	6.5	ug/kg	
SD12	1	Pacific sanddab	liver	Iron		88.9	mg/kg	1.3
SD12	1	Pacific sanddab	muscle	Iron		5.55	mg/kg	1.3
SD12	1	Pacific sanddab	liver	Lipids		16.1	%wt	0.005
SD12	1	Pacific sanddab	muscle	Lipids		0.13	%wt	0.005
SD12	1	Pacific sanddab	liver	o,p-DDE	E	12	ug/kg	
SD12	1	Pacific sanddab	muscle	o,p-DDE	E	0.2	ug/kg	
SD12	1	Pacific sanddab	liver	o,p-DDT	E	2.3	ug/kg	
SD12	1	Pacific sanddab	liver	p,p-DDD	E	8.6	ug/kg	
SD12	1	Pacific sanddab	liver	p,p-DDE		430	ug/kg	13.3
SD12	1	Pacific sanddab	muscle	p,p-DDE		2.6	ug/kg	1.33
SD12	1	Pacific sanddab	liver	p,p-DDT		46	ug/kg	13.3
SD12	1	Pacific sanddab	liver	PCB 101	E	10	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 105	E	5.6	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 110	E	8.7	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 118		18	ug/kg	13.3
SD12	1	Pacific sanddab	liver	PCB 123	E	2.1	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 128	E	4.7	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 138		24	ug/kg	13.3
SD12	1	Pacific sanddab	liver	PCB 149	E	4.8	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 151	E	3.5	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 153/168		40	ug/kg	13.3
SD12	1	Pacific sanddab	liver	PCB 156	E	1.7	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 158	E	1.6	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 167	E	1.3	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 170	E	6	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 177	E	1.5	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 180	E	13	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 183	E	3.7	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 187	E	13	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 194	E	3.1	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 201	E	3	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 206	E	3	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 52	E	3.6	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 66	E	2.9	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 70	E	3.5	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 74	E	1.9	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 87	E	2.4	ug/kg	
SD12	1	Pacific sanddab	liver	PCB 99	E	11	ug/kg	
SD12	1	Pacific sanddab	liver	Selenium		1.48	mg/kg	0.06
SD12	1	Pacific sanddab	muscle	Selenium		0.344	mg/kg	0.06
SD12	1	Pacific sanddab	liver	Total Solids		50.8	%wt	0.4
SD12	1	Pacific sanddab	muscle	Total Solids		19.2	%wt	0.4

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD12	1	Pacific sanddab	liver	Trans Nonachlor	E	12	ug/kg	
SD12	1	Pacific sanddab	liver	Zinc		24.2	mg/kg	0.58
SD12	1	Pacific sanddab	muscle	Zinc		3.08	mg/kg	0.58
SD12	2	Ca. scorpionfish	liver	Alpha (cis) Chlordane	E	3.4	ug/kg	
SD12	2	Ca. scorpionfish	muscle	Alpha (cis) Chlordane	E	0.4	ug/kg	
SD12	2	Ca. scorpionfish	liver	Aluminum		3.8	mg/kg	2.6
SD12	2	Ca. scorpionfish	muscle	Arsenic		6.2	mg/kg	1.4
SD12	2	Ca. scorpionfish	liver	Beryllium		0.058	mg/kg	0.035
SD12	2	Ca. scorpionfish	liver	Cadmium		2.31	mg/kg	0.34
SD12	2	Ca. scorpionfish	liver	Chromium		0.51	mg/kg	0.3
SD12	2	Ca. scorpionfish	liver	Copper		40.5	mg/kg	0.76
SD12	2	Ca. scorpionfish	liver	Hexachlorobenzene	E	4.4	ug/kg	
SD12	2	Ca. scorpionfish	muscle	Hexachlorobenzene	E	0.3	ug/kg	
SD12	2	Ca. scorpionfish	liver	Iron		116	mg/kg	1.3
SD12	2	Ca. scorpionfish	muscle	Iron		9.3	mg/kg	1.3
SD12	2	Ca. scorpionfish	liver	Lipids		21.1	%wt	0.005
SD12	2	Ca. scorpionfish	muscle	Lipids		0.81	%wt	0.005
SD12	2	Ca. scorpionfish	liver	Manganese		0.67	mg/kg	0.23
SD12	2	Ca. scorpionfish	liver	Mercury		0.079	mg/kg	0.03
SD12	2	Ca. scorpionfish	muscle	Mercury		0.483	mg/kg	0.03
SD12	2	Ca. scorpionfish	liver	o,p-DDE	E	3.1	ug/kg	
SD12	2	Ca. scorpionfish	muscle	o,p-DDE	E	0.6	ug/kg	
SD12	2	Ca. scorpionfish	liver	p,p-DDD	E	7.6	ug/kg	
SD12	2	Ca. scorpionfish	muscle	p,p-DDD	E	1.2	ug/kg	
SD12	2	Ca. scorpionfish	liver	p,p-DDE		1000	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	p,p-DDE		70	ug/kg	1.33
SD12	2	Ca. scorpionfish	liver	p,p-DDT	E	6.7	ug/kg	
SD12	2	Ca. scorpionfish	muscle	p,p-DDT	E	0.4	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 101		16	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	PCB 101	E	1.2	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 105	E	7	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 105	E	0.6	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 110	E	8.3	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 110	E	0.6	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 118		30	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	PCB 118		2.2	ug/kg	1.33
SD12	2	Ca. scorpionfish	liver	PCB 123	E	3.1	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 128	E	7.3	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 128	E	0.5	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 138		42	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	PCB 138		2.6	ug/kg	1.33
SD12	2	Ca. scorpionfish	liver	PCB 149	E	6.5	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 149	E	0.6	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 151	E	6.4	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 151	E	0.3	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 153/168		73	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	PCB 153/168		4.9	ug/kg	1.33
SD12	2	Ca. scorpionfish	liver	PCB 156	E	2	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 156	E	0.1	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 158	E	2.2	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 158	E	0.2	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD12	2	Ca. scorpionfish	liver	PCB 167	E	1.9	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 170	E	13	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 170	E	0.9	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 177	E	4.5	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 177	E	0.3	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 180		27	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	PCB 180		2	ug/kg	1.33
SD12	2	Ca. scorpionfish	liver	PCB 183	E	7.7	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 183	E	0.5	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 187		24	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	PCB 187		1.7	ug/kg	1.33
SD12	2	Ca. scorpionfish	liver	PCB 194	E	8.2	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 194	E	0.4	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 201	E	0.7	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 206	E	5.7	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 206	E	0.2	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 52	E	3.1	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 52	E	0.3	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 66	E	4.1	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 66	E	0.4	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 70	E	1.1	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 74	E	2.3	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 74	E	0.2	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 87	E	3.2	ug/kg	
SD12	2	Ca. scorpionfish	muscle	PCB 87	E	0.2	ug/kg	
SD12	2	Ca. scorpionfish	liver	PCB 99		14	ug/kg	13.3
SD12	2	Ca. scorpionfish	muscle	PCB 99	E	1	ug/kg	
SD12	2	Ca. scorpionfish	liver	Selenium		1.11	mg/kg	0.06
SD12	2	Ca. scorpionfish	muscle	Selenium		0.454	mg/kg	0.06
SD12	2	Ca. scorpionfish	liver	Total Solids		42.7	%wt	0.4
SD12	2	Ca. scorpionfish	muscle	Total Solids		24.8	%wt	0.4
SD12	2	Ca. scorpionfish	liver	Trans Nonachlor	E	15	ug/kg	
SD12	2	Ca. scorpionfish	muscle	Trans Nonachlor	E	1.1	ug/kg	
SD12	2	Ca. scorpionfish	liver	Zinc		94.6	mg/kg	0.58
SD12	2	Ca. scorpionfish	muscle	Zinc		3.92	mg/kg	0.58
SD12	3	Ca. scorpionfish	liver	Aluminum		9.5	mg/kg	2.6
SD12	3	Ca. scorpionfish	muscle	Aluminum		3.3	mg/kg	2.6
SD12	3	Ca. scorpionfish	liver	Arsenic		3.3	mg/kg	1.4
SD12	3	Ca. scorpionfish	muscle	Arsenic		3.1	mg/kg	1.4
SD12	3	Ca. scorpionfish	liver	Cadmium		1.91	mg/kg	0.34
SD12	3	Ca. scorpionfish	muscle	Chromium		0.38	mg/kg	0.3
SD12	3	Ca. scorpionfish	liver	Copper		46.2	mg/kg	0.76
SD12	3	Ca. scorpionfish	muscle	Copper		2.91	mg/kg	0.76
SD12	3	Ca. scorpionfish	liver	Hexachlorobenzene	E	5.8	ug/kg	
SD12	3	Ca. scorpionfish	muscle	Hexachlorobenzene	E	0.2	ug/kg	
SD12	3	Ca. scorpionfish	liver	Iron		139	mg/kg	1.3
SD12	3	Ca. scorpionfish	muscle	Iron		4.2	mg/kg	1.3
SD12	3	Ca. scorpionfish	liver	Lipids		28.6	%wt	0.005
SD12	3	Ca. scorpionfish	muscle	Lipids		2.98	%wt	0.005
SD12	3	Ca. scorpionfish	liver	Manganese		0.35	mg/kg	0.23
SD12	3	Ca. scorpionfish	liver	Mercury		0.045	mg/kg	0.03

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD12	3	Ca. scorpionfish	muscle	Mercury		0.179	mg/kg	0.03
SD12	3	Ca. scorpionfish	liver	o,p-DDE	E	2.4	ug/kg	
SD12	3	Ca. scorpionfish	liver	p,p-DDD	E	4.7	ug/kg	
SD12	3	Ca. scorpionfish	liver	p,p-DDE		390	ug/kg	13.3
SD12	3	Ca. scorpionfish	muscle	p,p-DDE		12	ug/kg	1.33
SD12	3	Ca. scorpionfish	liver	p,p-DDT	E	5.4	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 101	E	10	ug/kg	
SD12	3	Ca. scorpionfish	muscle	PCB 101	E	0.2	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 105	E	6.6	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 110	E	6.4	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 118		21	ug/kg	13.3
SD12	3	Ca. scorpionfish	muscle	PCB 118	E	0.4	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 123	E	2.1	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 128	E	5.3	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 138		29	ug/kg	13.3
SD12	3	Ca. scorpionfish	muscle	PCB 138	E	0.5	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 149	E	4	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 151	E	3.8	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 153/168		52	ug/kg	13.3
SD12	3	Ca. scorpionfish	muscle	PCB 153/168	E	0.9	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 156	E	2	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 158	E	2.1	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 167	E	1.4	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 170	E	9.4	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 177	E	3.7	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 180		21	ug/kg	13.3
SD12	3	Ca. scorpionfish	muscle	PCB 180	E	0.3	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 183	E	5.9	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 187		18	ug/kg	13.3
SD12	3	Ca. scorpionfish	muscle	PCB 187	E	0.2	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 194	E	6.6	ug/kg	
SD12	3	Ca. scorpionfish	muscle	PCB 194	E	0.1	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 201	E	7.5	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 206	E	4.6	ug/kg	
SD12	3	Ca. scorpionfish	muscle	PCB 206	E	0.2	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 52	E	4.5	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 66	E	3.7	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 70	E	2	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 87	E	2.5	ug/kg	
SD12	3	Ca. scorpionfish	liver	PCB 99	E	10	ug/kg	
SD12	3	Ca. scorpionfish	muscle	PCB 99	E	0.2	ug/kg	
SD12	3	Ca. scorpionfish	liver	Selenium		0.776	mg/kg	0.06
SD12	3	Ca. scorpionfish	muscle	Selenium		0.408	mg/kg	0.06
SD12	3	Ca. scorpionfish	liver	Total Solids		47.7	%wt	0.4
SD12	3	Ca. scorpionfish	muscle	Total Solids		21.3	%wt	0.4
SD12	3	Ca. scorpionfish	liver	Trans Nonachlor	E	8.1	ug/kg	
SD12	3	Ca. scorpionfish	liver	Zinc		93.3	mg/kg	0.58
SD12	3	Ca. scorpionfish	muscle	Zinc		2.88	mg/kg	0.58
SD13	1	Ca. scorpionfish	liver	Alpha (cis) Chlordane	E	3.7	ug/kg	
SD13	1	Ca. scorpionfish	liver	Aluminum		13.1	mg/kg	2.6
SD13	1	Ca. scorpionfish	liver	Arsenic		1.7	mg/kg	1.4

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD13	1	Ca. scorpionfish	muscle	Arsenic		4.8	mg/kg	1.4
SD13	1	Ca. scorpionfish	liver	Cadmium		3.17	mg/kg	0.34
SD13	1	Ca. scorpionfish	liver	Copper		40.1	mg/kg	0.76
SD13	1	Ca. scorpionfish	liver	Iron		187	mg/kg	1.3
SD13	1	Ca. scorpionfish	muscle	Iron		7.8	mg/kg	1.3
SD13	1	Ca. scorpionfish	liver	Lipids		25.5	%wt	0.005
SD13	1	Ca. scorpionfish	muscle	Lipids		1.45	%wt	0.005
SD13	1	Ca. scorpionfish	liver	Manganese		0.34	mg/kg	0.23
SD13	1	Ca. scorpionfish	liver	Mercury		0.039	mg/kg	0.03
SD13	1	Ca. scorpionfish	muscle	Mercury		0.174	mg/kg	0.03
SD13	1	Ca. scorpionfish	liver	o,p-DDE	E	1.8	ug/kg	
SD13	1	Ca. scorpionfish	liver	p,p-DDD	E	4.5	ug/kg	
SD13	1	Ca. scorpionfish	liver	p,p-DDE		480	ug/kg	13.3
SD13	1	Ca. scorpionfish	muscle	p,p-DDE		15.5	ug/kg	1.33
SD13	1	Ca. scorpionfish	liver	p,p-DDT	E	4.3	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 101	E	7.4	ug/kg	
SD13	1	Ca. scorpionfish	muscle	PCB 101	E	0.3	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 105	E	2.3	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 110	E	3.9	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 118		18	ug/kg	13.3
SD13	1	Ca. scorpionfish	muscle	PCB 118	E	0.65	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 128	E	4	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 138		23	ug/kg	13.3
SD13	1	Ca. scorpionfish	muscle	PCB 138	E	0.85	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 149	E	3.4	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 151	E	1.8	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 153/168		43	ug/kg	13.3
SD13	1	Ca. scorpionfish	muscle	PCB 153/168		1.7	ug/kg	1.33
SD13	1	Ca. scorpionfish	liver	PCB 158	E	1.6	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 170	E	6.7	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 177	E	2	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 180		15	ug/kg	13.3
SD13	1	Ca. scorpionfish	muscle	PCB 180	E	0.75	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 183	E	4.9	ug/kg	
SD13	1	Ca. scorpionfish	muscle	PCB 183	E	0.15	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 187		15	ug/kg	13.3
SD13	1	Ca. scorpionfish	muscle	PCB 187	E	0.7	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 194	E	4.9	ug/kg	
SD13	1	Ca. scorpionfish	muscle	PCB 194	E	0.2	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 201	E	6.3	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 206	E	4.2	ug/kg	
SD13	1	Ca. scorpionfish	muscle	PCB 206	E	0.2	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 28	E	9.7	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 37	E	2.3	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 44	E	4.4	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 49	E	4.3	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 52	E	5.7	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 66	E	6.1	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 70	E	4	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 74	E	3.1	ug/kg	
SD13	1	Ca. scorpionfish	liver	PCB 87	E	1.4	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD13	1	Ca. scorpionfish	liver	PCB 99	E	8.8	ug/kg	
SD13	1	Ca. scorpionfish	muscle	PCB 99	E	0.35	ug/kg	
SD13	1	Ca. scorpionfish	liver	Selenium		0.807	mg/kg	0.06
SD13	1	Ca. scorpionfish	muscle	Selenium		0.312	mg/kg	0.06
SD13	1	Ca. scorpionfish	liver	Total Solids		45.3	%wt	0.4
SD13	1	Ca. scorpionfish	muscle	Total Solids		23.3	%wt	0.4
SD13	1	Ca. scorpionfish	liver	Trans Nonachlor	E	8.5	ug/kg	
SD13	1	Ca. scorpionfish	liver	Zinc		83.7	mg/kg	0.58
SD13	1	Ca. scorpionfish	muscle	Zinc		4.13	mg/kg	0.58
SD13	2	Longfin sanddab	liver	Alpha (cis) Chlordane	E	6.5	ug/kg	
SD13	2	Longfin sanddab	liver	Aluminum		4.8	mg/kg	2.6
SD13	2	Longfin sanddab	liver	Arsenic		9.4	mg/kg	1.4
SD13	2	Longfin sanddab	muscle	Arsenic		5.4	mg/kg	1.4
SD13	2	Longfin sanddab	liver	BHC, Alpha isomer		45	ug/kg	20
SD13	2	Longfin sanddab	liver	BHC, Beta isomer		53	ug/kg	20
SD13	2	Longfin sanddab	liver	BHC, Delta isomer		160	ug/kg	20
SD13	2	Longfin sanddab	liver	BHC, Gamma isomer		130	ug/kg	100
SD13	2	Longfin sanddab	liver	Cadmium		2.08	mg/kg	0.34
SD13	2	Longfin sanddab	muscle	Chromium		0.53	mg/kg	0.3
SD13	2	Longfin sanddab	liver	Copper		10.2	mg/kg	0.76
SD13	2	Longfin sanddab	muscle	Copper		8.58	mg/kg	0.76
SD13	2	Longfin sanddab	liver	Endrin		50	ug/kg	20
SD13	2	Longfin sanddab	liver	Gamma (trans) Chlordane		16	ug/kg	13.3
SD13	2	Longfin sanddab	liver	Hexachlorobenzene	E	2	ug/kg	
SD13	2	Longfin sanddab	liver	Iron		171	mg/kg	1.3
SD13	2	Longfin sanddab	muscle	Iron		7.3	mg/kg	1.3
SD13	2	Longfin sanddab	liver	Lipids		14.7	%wt	0.005
SD13	2	Longfin sanddab	muscle	Lipids		0.2	%wt	0.005
SD13	2	Longfin sanddab	liver	Manganese		1.19	mg/kg	0.23
SD13	2	Longfin sanddab	muscle	Mercury		0.055	mg/kg	0.03
SD13	2	Longfin sanddab	liver	o,p-DDE	E	11	ug/kg	
SD13	2	Longfin sanddab	liver	o,p-DDT	E	0.7	ug/kg	
SD13	2	Longfin sanddab	liver	p,p-DDD		18	ug/kg	13.3
SD13	2	Longfin sanddab	liver	p,p-DDE		430	ug/kg	13.3
SD13	2	Longfin sanddab	muscle	p,p-DDE		6.1	ug/kg	1.33
SD13	2	Longfin sanddab	liver	p,p-DDT		35	ug/kg	13.3
SD13	2	Longfin sanddab	liver	PCB 101	E	7.8	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 105	E	7.4	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 110	E	9.1	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 118		24	ug/kg	13.3
SD13	2	Longfin sanddab	muscle	PCB 118	E	0.3	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 123	E	2.1	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 128	E	9.9	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 138		52	ug/kg	13.3
SD13	2	Longfin sanddab	muscle	PCB 138	E	0.7	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 149	E	8.4	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 151	E	6.4	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 153/168		90	ug/kg	13.3
SD13	2	Longfin sanddab	muscle	PCB 153/168	E	1	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 156	E	3.8	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 157	E	1.2	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD13	2	Longfin sanddab	liver	PCB 158	E	4.1	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 167	E	2.7	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 170		18	ug/kg	13.3
SD13	2	Longfin sanddab	liver	PCB 177	E	6.4	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 180		38	ug/kg	13.3
SD13	2	Longfin sanddab	muscle	PCB 180	E	0.5	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 183	E	12	ug/kg	
SD13	2	Longfin sanddab	muscle	PCB 183	E	0.2	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 187		34	ug/kg	13.3
SD13	2	Longfin sanddab	muscle	PCB 187	E	0.3	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 194		14	ug/kg	13.3
SD13	2	Longfin sanddab	muscle	PCB 194	E	0.1	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 201		15	ug/kg	13.3
SD13	2	Longfin sanddab	liver	PCB 206	E	8	ug/kg	
SD13	2	Longfin sanddab	muscle	PCB 206	E	0.2	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 52	E	2.1	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 66	E	2.5	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 70	E	1.9	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 74	E	1.8	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 87	E	0.9	ug/kg	
SD13	2	Longfin sanddab	liver	PCB 99		15	ug/kg	13.3
SD13	2	Longfin sanddab	liver	Selenium		3.15	mg/kg	0.06
SD13	2	Longfin sanddab	muscle	Selenium		2.22	mg/kg	0.06
SD13	2	Longfin sanddab	liver	Total Solids		32.7	%wt	0.4
SD13	2	Longfin sanddab	muscle	Total Solids		18.5	%wt	0.4
SD13	2	Longfin sanddab	liver	Trans Nonachlor	E	8.3	ug/kg	
SD13	2	Longfin sanddab	liver	Zinc		22.3	mg/kg	0.58
SD13	2	Longfin sanddab	muscle	Zinc		3.78	mg/kg	0.58
SD13	3	Pacific sanddab	liver	Alpha (cis) Chlordane	E	10	ug/kg	
SD13	3	Pacific sanddab	liver	Aluminum		10.1	mg/kg	2.6
SD13	3	Pacific sanddab	muscle	Aluminum		6.1	mg/kg	2.6
SD13	3	Pacific sanddab	liver	Arsenic		2.4	mg/kg	1.4
SD13	3	Pacific sanddab	muscle	Arsenic		2.9	mg/kg	1.4
SD13	3	Pacific sanddab	liver	BHC, Alpha isomer	E	18	ug/kg	
SD13	3	Pacific sanddab	liver	BHC, Delta isomer		43	ug/kg	20
SD13	3	Pacific sanddab	liver	Cadmium		1.87	mg/kg	0.34
SD13	3	Pacific sanddab	liver	Copper		14.3	mg/kg	0.76
SD13	3	Pacific sanddab	liver	Endrin	E	11	ug/kg	
SD13	3	Pacific sanddab	liver	Gamma (trans) Chlordane	E	7.2	ug/kg	
SD13	3	Pacific sanddab	liver	Hexachlorobenzene	E	6.8	ug/kg	
SD13	3	Pacific sanddab	liver	Iron		66.6	mg/kg	1.3
SD13	3	Pacific sanddab	muscle	Iron		3.8	mg/kg	1.3
SD13	3	Pacific sanddab	liver	Lipids		41.5	%wt	0.005
SD13	3	Pacific sanddab	muscle	Lipids		0.53	%wt	0.005
SD13	3	Pacific sanddab	liver	Manganese		0.89	mg/kg	0.23
SD13	3	Pacific sanddab	liver	o,p-DDE		19	ug/kg	13.3
SD13	3	Pacific sanddab	liver	o,p-DDT	E	3.9	ug/kg	
SD13	3	Pacific sanddab	liver	p,p-DDD	E	13	ug/kg	
SD13	3	Pacific sanddab	liver	p,p-DDE		670	ug/kg	13.3
SD13	3	Pacific sanddab	muscle	p,p-DDE		3.4	ug/kg	1.33
SD13	3	Pacific sanddab	liver	p,p-DDT		49	ug/kg	13.3

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD13	3	Pacific sanddab	liver	PCB 101		14	ug/kg	13.3
SD13	3	Pacific sanddab	liver	PCB 105	E	7.4	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 110	E	12	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 118		26	ug/kg	13.3
SD13	3	Pacific sanddab	liver	PCB 123	E	3	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 128	E	6.9	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 138		37	ug/kg	13.3
SD13	3	Pacific sanddab	muscle	PCB 138	E	0.2	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 149	E	8.1	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 151	E	6.1	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 153/168		64	ug/kg	13.3
SD13	3	Pacific sanddab	muscle	PCB 153/168	E	0.3	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 156	E	2.1	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 157	E	1.2	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 158	E	2.5	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 167	E	1.6	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 170	E	9.5	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 177	E	3.1	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 180		21	ug/kg	13.3
SD13	3	Pacific sanddab	muscle	PCB 180	E	0.1	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 183	E	6.7	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 187		23	ug/kg	13.3
SD13	3	Pacific sanddab	liver	PCB 194	E	5.5	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 201	E	6.4	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 206	E	4.4	ug/kg	
SD13	3	Pacific sanddab	muscle	PCB 206	E	0.1	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 52	E	4.3	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 66	E	3.6	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 70	E	4.1	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 74	E	2.5	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 87	E	3.2	ug/kg	
SD13	3	Pacific sanddab	liver	PCB 99		16	ug/kg	13.3
SD13	3	Pacific sanddab	liver	Selenium		0.975	mg/kg	0.06
SD13	3	Pacific sanddab	muscle	Selenium		0.327	mg/kg	0.06
SD13	3	Pacific sanddab	liver	Total Solids		58.4	%wt	0.4
SD13	3	Pacific sanddab	muscle	Total Solids		20	%wt	0.4
SD13	3	Pacific sanddab	liver	Trans Nonachlor	E	15	ug/kg	
SD13	3	Pacific sanddab	liver	Zinc		21.7	mg/kg	0.58
SD13	3	Pacific sanddab	muscle	Zinc		3.25	mg/kg	0.58
SD14	1	Pacific sanddab	liver	Alpha (cis) Chlordane	E	7.6	ug/kg	
SD14	1	Pacific sanddab	liver	Aluminum		7.3	mg/kg	2.6
SD14	1	Pacific sanddab	liver	Arsenic		2.1	mg/kg	1.4
SD14	1	Pacific sanddab	muscle	Arsenic		4.1	mg/kg	1.4
SD14	1	Pacific sanddab	liver	Cadmium		2.94	mg/kg	0.34
SD14	1	Pacific sanddab	muscle	Chromium		0.35	mg/kg	0.3
SD14	1	Pacific sanddab	liver	Copper		14.6	mg/kg	0.76
SD14	1	Pacific sanddab	liver	Hexachlorobenzene	E	5.8	ug/kg	
SD14	1	Pacific sanddab	liver	Iron		81.1	mg/kg	1.3
SD14	1	Pacific sanddab	muscle	Iron		2.3	mg/kg	1.3
SD14	1	Pacific sanddab	liver	Lipids		35.1	%wt	0.005
SD14	1	Pacific sanddab	muscle	Lipids		0.31	%wt	0.005

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD14	1	Pacific sanddab	liver	Manganese		1.02	mg/kg	0.23
SD14	1	Pacific sanddab	liver	o,p-DDE		14	ug/kg	13.3
SD14	1	Pacific sanddab	liver	o,p-DDT	E	3.1	ug/kg	
SD14	1	Pacific sanddab	liver	p,p-DDD	E	8.6	ug/kg	
SD14	1	Pacific sanddab	liver	p,p-DDE		740	ug/kg	13.3
SD14	1	Pacific sanddab	muscle	p,p-DDE		2.6	ug/kg	1.33
SD14	1	Pacific sanddab	liver	p,p-DDT		34	ug/kg	13.3
SD14	1	Pacific sanddab	liver	PCB 101	E	13	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 105	E	7.4	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 110	E	12	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 118		25	ug/kg	13.3
SD14	1	Pacific sanddab	liver	PCB 123	E	3.4	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 128	E	5.6	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 138		31	ug/kg	13.3
SD14	1	Pacific sanddab	muscle	PCB 138	E	0.1	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 149	E	7.6	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 151	E	4.5	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 153/168		53	ug/kg	13.3
SD14	1	Pacific sanddab	muscle	PCB 153/168	E	0.2	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 156	E	1.4	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 157	E	1	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 158	E	2.1	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 167	E	1.6	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 170	E	8.9	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 177	E	2.3	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 180		17	ug/kg	13.3
SD14	1	Pacific sanddab	liver	PCB 183	E	5.3	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 187		17	ug/kg	13.3
SD14	1	Pacific sanddab	liver	PCB 194	E	4.8	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 201	E	6.6	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 206	E	3.5	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 52	E	4.8	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 66	E	3.8	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 70	E	4.2	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 74	E	2.7	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 87	E	3.4	ug/kg	
SD14	1	Pacific sanddab	liver	PCB 99		14	ug/kg	13.3
SD14	1	Pacific sanddab	liver	Selenium		0.808	mg/kg	0.06
SD14	1	Pacific sanddab	muscle	Selenium		0.278	mg/kg	0.06
SD14	1	Pacific sanddab	liver	Total Solids		51.3	%wt	0.4
SD14	1	Pacific sanddab	muscle	Total Solids		18.4	%wt	0.4
SD14	1	Pacific sanddab	liver	Trans Nonachlor	E	14	ug/kg	
SD14	1	Pacific sanddab	liver	Zinc		24.3	mg/kg	0.58
SD14	1	Pacific sanddab	muscle	Zinc		3.14	mg/kg	0.58
SD14	2	Pacific sanddab	liver	Alpha (cis) Chlordane	E	10.4	ug/kg	
SD14	2	Pacific sanddab	liver	Aluminum		5.2	mg/kg	2.6
SD14	2	Pacific sanddab	liver	Arsenic		2.7	mg/kg	1.4
SD14	2	Pacific sanddab	muscle	Arsenic		3.3	mg/kg	1.4
SD14	2	Pacific sanddab	liver	Cadmium		1.81	mg/kg	0.34
SD14	2	Pacific sanddab	liver	Copper		6.74	mg/kg	0.76
SD14	2	Pacific sanddab	muscle	Copper		1.17	mg/kg	0.76

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD14	2	Pacific sanddab	liver	Hexachlorobenzene	E	6.45	ug/kg	
SD14	2	Pacific sanddab	liver	Iron		69.7	mg/kg	1.3
SD14	2	Pacific sanddab	muscle	Iron		3.7	mg/kg	1.3
SD14	2	Pacific sanddab	liver	Lipids		38.8	%wt	0.005
SD14	2	Pacific sanddab	muscle	Lipids		0.39	%wt	0.005
SD14	2	Pacific sanddab	liver	Manganese		0.88	mg/kg	0.23
SD14	2	Pacific sanddab	liver	o,p-DDE		16.5	ug/kg	13.3
SD14	2	Pacific sanddab	liver	o,p-DDT	E	3.1	ug/kg	
SD14	2	Pacific sanddab	liver	p,p-DDD	E	8.5	ug/kg	
SD14	2	Pacific sanddab	liver	p,p-DDE		575	ug/kg	13.3
SD14	2	Pacific sanddab	muscle	p,p-DDE		2.5	ug/kg	1.33
SD14	2	Pacific sanddab	liver	p,p-DDT		40.5	ug/kg	13.3
SD14	2	Pacific sanddab	liver	PCB 101	E	10.5	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 105	E	5.9	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 110	E	9.8	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 118		20.5	ug/kg	13.3
SD14	2	Pacific sanddab	liver	PCB 123	E	2.25	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 128	E	5.1	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 138		29.5	ug/kg	13.3
SD14	2	Pacific sanddab	liver	PCB 149	E	5.45	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 151	E	4.75	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 153/168		50.5	ug/kg	13.3
SD14	2	Pacific sanddab	muscle	PCB 153/168	E	0.2	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 156	E	1.15	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 158	E	2	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 167	E	1.05	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 170	E	7.8	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 177	E	2.25	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 180		17.5	ug/kg	13.3
SD14	2	Pacific sanddab	liver	PCB 183	E	5.25	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 187		18.5	ug/kg	13.3
SD14	2	Pacific sanddab	liver	PCB 194	E	4.8	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 201	E	5.3	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 206	E	3.2	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 52	E	3.7	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 66	E	2.95	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 70	E	3.45	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 87	E	2.05	ug/kg	
SD14	2	Pacific sanddab	liver	PCB 99	E	12.5	ug/kg	
SD14	2	Pacific sanddab	liver	Selenium		0.944	mg/kg	0.06
SD14	2	Pacific sanddab	muscle	Selenium		0.254	mg/kg	0.06
SD14	2	Pacific sanddab	liver	Total Solids		50.8	%wt	0.4
SD14	2	Pacific sanddab	muscle	Total Solids		19.9	%wt	0.4
SD14	2	Pacific sanddab	liver	Trans Nonachlor	E	13	ug/kg	
SD14	2	Pacific sanddab	liver	Zinc		24.9	mg/kg	0.58
SD14	2	Pacific sanddab	muscle	Zinc		3.24	mg/kg	0.58
SD14	3	Ca. scorpionfish	liver	Aluminum		12.9	mg/kg	2.6
SD14	3	Ca. scorpionfish	muscle	Arsenic		2.8	mg/kg	1.4
SD14	3	Ca. scorpionfish	liver	Cadmium		3.77	mg/kg	0.34
SD14	3	Ca. scorpionfish	liver	Copper		31.2	mg/kg	0.76
SD14	3	Ca. scorpionfish	muscle	Copper		19.8	mg/kg	0.76

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD14	3	Ca. scorpionfish	liver	Iron		144	mg/kg	1.3
SD14	3	Ca. scorpionfish	muscle	Iron		4.1	mg/kg	1.3
SD14	3	Ca. scorpionfish	liver	Lipids		18	%wt	0.005
SD14	3	Ca. scorpionfish	muscle	Lipids		0.74	%wt	0.005
SD14	3	Ca. scorpionfish	liver	Manganese		0.28	mg/kg	0.23
SD14	3	Ca. scorpionfish	liver	Mercury		0.166	mg/kg	0.03
SD14	3	Ca. scorpionfish	muscle	Mercury		0.329	mg/kg	0.03
SD14	3	Ca. scorpionfish	liver	o,p-DDE	E	2.8	ug/kg	
SD14	3	Ca. scorpionfish	liver	p,p-DDD	E	9.4	ug/kg	
SD14	3	Ca. scorpionfish	muscle	p,p-DDD	E	0.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	p,p-DDE		1110	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	p,p-DDE		24	ug/kg	1.33
SD14	3	Ca. scorpionfish	liver	p,p-DDT	E	8.1	ug/kg	
SD14	3	Ca. scorpionfish	muscle	p,p-DDT	E	0.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 101		20	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	PCB 101	E	0.7	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 105	E	10	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 105	E	0.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 110	E	12	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 110	E	0.4	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 118		38	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	PCB 118	E	1.2	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 123	E	3.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 128	E	9.2	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 128	E	0.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 138		52	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	PCB 138		1.5	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 149	E	9.1	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 149	E	0.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 151	E	7.2	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 151	E	0.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 153/168		90	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	PCB 153/168		2.6	ug/kg	1.33
SD14	3	Ca. scorpionfish	liver	PCB 156	E	2.3	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 156	E	0.1	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 158	E	4.2	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 158	E	0.1	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 167	E	2	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 170		18	ug/kg	13.3
SD14	3	Ca. scorpionfish	liver	PCB 177	E	6	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 177	E	0.1	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 180		35	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	PCB 180	E	1.1	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 183	E	11	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 183	E	0.3	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 187		33	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	PCB 187	E	0.8	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 194	E	10	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 194	E	0.2	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 206	E	5.8	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 206	E	0.2	ug/kg	

Appendix D.3 April 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
SD14	3	Ca. scorpionfish	liver	PCB 52	E	4	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 66	E	4.5	ug/kg	
SD14	3	Ca. scorpionfish	muscle	PCB 66	E	0.2	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 70	E	1	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 74	E	2.8	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 87	E	4	ug/kg	
SD14	3	Ca. scorpionfish	liver	PCB 99		18	ug/kg	13.3
SD14	3	Ca. scorpionfish	muscle	PCB 99	E	0.6	ug/kg	
SD14	3	Ca. scorpionfish	liver	Selenium		0.698	mg/kg	0.06
SD14	3	Ca. scorpionfish	muscle	Selenium		0.416	mg/kg	0.06
SD14	3	Ca. scorpionfish	liver	Total Solids		48.4	%wt	0.4
SD14	3	Ca. scorpionfish	muscle	Total Solids		20.6	%wt	0.4
SD14	3	Ca. scorpionfish	liver	Trans Nonachlor	E	14	ug/kg	
SD14	3	Ca. scorpionfish	muscle	Trans Nonachlor	E	0.5	ug/kg	
SD14	3	Ca. scorpionfish	liver	Zinc		106	mg/kg	0.58
SD14	3	Ca. scorpionfish	muscle	Zinc		4.04	mg/kg	0.58

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF1	1	Copper rockfish	muscle	Aluminum		3.19	mg/kg	0.583
RF1	1	Copper rockfish	muscle	Arsenic		2.79	mg/kg	0.375
RF1	1	Copper rockfish	muscle	Barium		0.049	mg/kg	0.007
RF1	1	Copper rockfish	muscle	Chromium		0.226	mg/kg	0.08
RF1	1	Copper rockfish	muscle	Copper		0.207	mg/kg	0.068
RF1	1	Copper rockfish	muscle	Hexachlorobenzene	E	0.3	ug/kg	
RF1	1	Copper rockfish	muscle	Iron		1.45	mg/kg	0.096
RF1	1	Copper rockfish	muscle	Lipids		0.56	%wt	0.005
RF1	1	Copper rockfish	muscle	Manganese		0.068	mg/kg	0.007
RF1	1	Copper rockfish	muscle	Mercury		0.788	mg/kg	0.03
RF1	1	Copper rockfish	muscle	p,p-DDD	E	0.1	ug/kg	
RF1	1	Copper rockfish	muscle	p,p-DDE		14	ug/kg	1.33
RF1	1	Copper rockfish	muscle	PCB 101	E	0.3	ug/kg	
RF1	1	Copper rockfish	muscle	PCB 118	E	0.5	ug/kg	
RF1	1	Copper rockfish	muscle	PCB 138	E	0.6	ug/kg	
RF1	1	Copper rockfish	muscle	PCB 153/168	E	0.8	ug/kg	
RF1	1	Copper rockfish	muscle	PCB 180	E	0.3	ug/kg	
RF1	1	Copper rockfish	muscle	PCB 187	E	0.4	ug/kg	
RF1	1	Copper rockfish	muscle	PCB 52	E	0.1	ug/kg	
RF1	1	Copper rockfish	muscle	PCB 99	E	0.2	ug/kg	
RF1	1	Copper rockfish	muscle	Selenium		0.604	mg/kg	0.06
RF1	1	Copper rockfish	muscle	Tin		0.581	mg/kg	0.24
RF1	1	Copper rockfish	muscle	Total Solids		23.9	%wt	0.4
RF1	1	Copper rockfish	muscle	Zinc		3.52	mg/kg	0.049
RF1	2	Mixed rockfish	muscle	Aluminum		2.92	mg/kg	0.583
RF1	2	Mixed rockfish	muscle	Arsenic		3.14	mg/kg	0.375
RF1	2	Mixed rockfish	muscle	Barium		0.053	mg/kg	0.007
RF1	2	Mixed rockfish	muscle	Chromium		0.167	mg/kg	0.08
RF1	2	Mixed rockfish	muscle	Copper		0.334	mg/kg	0.068
RF1	2	Mixed rockfish	muscle	Hexachlorobenzene	E	0.2	ug/kg	
RF1	2	Mixed rockfish	muscle	Iron		2.42	mg/kg	0.096
RF1	2	Mixed rockfish	muscle	Lipids		0.26	%wt	0.005
RF1	2	Mixed rockfish	muscle	Manganese		0.103	mg/kg	0.007
RF1	2	Mixed rockfish	muscle	Mercury		0.578	mg/kg	0.03
RF1	2	Mixed rockfish	muscle	p,p-DDE		5.7	ug/kg	1.33
RF1	2	Mixed rockfish	muscle	PCB 101	E	0.2	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 118	E	0.3	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 153/168	E	0.6	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 180	E	0.2	ug/kg	
RF1	2	Mixed rockfish	muscle	PCB 99	E	0.1	ug/kg	
RF1	2	Mixed rockfish	muscle	Selenium		0.394	mg/kg	0.06
RF1	2	Mixed rockfish	muscle	Tin		0.486	mg/kg	0.24
RF1	2	Mixed rockfish	muscle	Total Solids		21.8	%wt	0.4
RF1	2	Mixed rockfish	muscle	Zinc		3.47	mg/kg	0.049
RF1	3	Vermilion rockfish	muscle	Aluminum		5.99	mg/kg	0.583
RF1	3	Vermilion rockfish	muscle	Arsenic		1.54	mg/kg	0.375
RF1	3	Vermilion rockfish	muscle	Barium		0.052	mg/kg	0.007
RF1	3	Vermilion rockfish	muscle	Chromium		0.149	mg/kg	0.08
RF1	3	Vermilion rockfish	muscle	Copper		0.321	mg/kg	0.068
RF1	3	Vermilion rockfish	muscle	Hexachlorobenzene	E	0.1	ug/kg	
RF1	3	Vermilion rockfish	muscle	Iron		3.17	mg/kg	0.096

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF1	3	Vermilion rockfish	muscle	Lipids		1.64	%wt	0.005
RF1	3	Vermilion rockfish	muscle	Manganese		0.113	mg/kg	0.007
RF1	3	Vermilion rockfish	muscle	Mercury		0.06	mg/kg	0.03
RF1	3	Vermilion rockfish	muscle	o,p-DDD	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	muscle	o,p-DDT	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	muscle	p,p-DDD	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	muscle	p,p-DDE		13	ug/kg	1.33
RF1	3	Vermilion rockfish	muscle	p,p-DDT	E	0.3	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 101	E	0.4	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 105	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 110	E	0.4	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 118	E	0.6	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 128	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 138	E	0.8	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 149	E	0.5	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 153/168	E	1.3	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 180	E	0.4	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 183	E	0.2	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 187	E	0.5	ug/kg	
RF1	3	Vermilion rockfish	muscle	PCB 99	E	0.4	ug/kg	
RF1	3	Vermilion rockfish	muscle	Selenium		0.277	mg/kg	0.06
RF1	3	Vermilion rockfish	muscle	Tin		0.469	mg/kg	0.24
RF1	3	Vermilion rockfish	muscle	Total Solids		21.8	%wt	0.4
RF1	3	Vermilion rockfish	muscle	Zinc		3.37	mg/kg	0.049
RF2	1	Vermilion rockfish	muscle	Aluminum		3.43	mg/kg	0.583
RF2	1	Vermilion rockfish	muscle	Arsenic		1.42	mg/kg	0.375
RF2	1	Vermilion rockfish	muscle	Barium		0.054	mg/kg	0.007
RF2	1	Vermilion rockfish	muscle	Chromium		0.253	mg/kg	0.08
RF2	1	Vermilion rockfish	muscle	Copper		0.345	mg/kg	0.068
RF2	1	Vermilion rockfish	muscle	Hexachlorobenzene	E	0.2	ug/kg	
RF2	1	Vermilion rockfish	muscle	Iron		5.12	mg/kg	0.096
RF2	1	Vermilion rockfish	muscle	Lipids		1.32	%wt	0.005
RF2	1	Vermilion rockfish	muscle	Manganese		0.137	mg/kg	0.007
RF2	1	Vermilion rockfish	muscle	Mercury		0.093	mg/kg	0.03
RF2	1	Vermilion rockfish	muscle	p,p-DDD	E	0.4	ug/kg	
RF2	1	Vermilion rockfish	muscle	p,p-DDE		15	ug/kg	1.33
RF2	1	Vermilion rockfish	muscle	p,p-DDT	E	0.3	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 101	E	0.4	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 105	E	0.2	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 110	E	0.4	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 118	E	0.6	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 138	E	0.7	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 149	E	0.3	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 153/168	E	1.3	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 180	E	0.4	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 187	E	0.5	ug/kg	
RF2	1	Vermilion rockfish	muscle	PCB 99	E	0.3	ug/kg	
RF2	1	Vermilion rockfish	muscle	Selenium		0.381	mg/kg	0.06
RF2	1	Vermilion rockfish	muscle	Tin		0.554	mg/kg	0.24
RF2	1	Vermilion rockfish	muscle	Total Solids		23.5	%wt	0.4
RF2	1	Vermilion rockfish	muscle	Zinc		3.66	mg/kg	0.049

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF2	2	Vermilion rockfish	muscle	Alpha (cis) Chlordane	E	1.3	ug/kg	
RF2	2	Vermilion rockfish	muscle	Aluminum		3.52	mg/kg	0.583
RF2	2	Vermilion rockfish	muscle	Arsenic		1.95	mg/kg	0.375
RF2	2	Vermilion rockfish	muscle	Barium		0.052	mg/kg	0.007
RF2	2	Vermilion rockfish	muscle	Chromium		0.132	mg/kg	0.08
RF2	2	Vermilion rockfish	muscle	Copper		0.453	mg/kg	0.068
RF2	2	Vermilion rockfish	muscle	Gamma (trans) Chlordane	E	0.7	ug/kg	
RF2	2	Vermilion rockfish	muscle	Hexachlorobenzene	E	0.3	ug/kg	
RF2	2	Vermilion rockfish	muscle	Iron		3.43	mg/kg	0.096
RF2	2	Vermilion rockfish	muscle	Lipids		1.59	%wt	0.005
RF2	2	Vermilion rockfish	muscle	Manganese		0.113	mg/kg	0.007
RF2	2	Vermilion rockfish	muscle	Mercury		0.103	mg/kg	0.03
RF2	2	Vermilion rockfish	muscle	p,p-DDD	E	0.5	ug/kg	
RF2	2	Vermilion rockfish	muscle	p,p-DDE		20	ug/kg	1.33
RF2	2	Vermilion rockfish	muscle	p,p-DDT	E	0.8	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 101	E	0.5	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 110	E	0.6	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 118	E	0.8	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 128	E	0.2	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 138	E	0.8	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 149	E	0.6	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 153/168		1.6	ug/kg	1.33
RF2	2	Vermilion rockfish	muscle	PCB 180	E	0.6	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 183	E	0.1	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 187	E	0.6	ug/kg	
RF2	2	Vermilion rockfish	muscle	PCB 99	E	0.4	ug/kg	
RF2	2	Vermilion rockfish	muscle	Selenium		0.379	mg/kg	0.06
RF2	2	Vermilion rockfish	muscle	Tin		0.539	mg/kg	0.24
RF2	2	Vermilion rockfish	muscle	Total Solids		23.4	%wt	0.4
RF2	2	Vermilion rockfish	muscle	Zinc		4.3	mg/kg	0.049
RF2	3	Vermilion rockfish	muscle	Aluminum		4.24	mg/kg	0.583
RF2	3	Vermilion rockfish	muscle	Arsenic		2.03	mg/kg	0.375
RF2	3	Vermilion rockfish	muscle	Barium		0.058	mg/kg	0.007
RF2	3	Vermilion rockfish	muscle	Chromium		0.17	mg/kg	0.08
RF2	3	Vermilion rockfish	muscle	Copper		0.39	mg/kg	0.068
RF2	3	Vermilion rockfish	muscle	Hexachlorobenzene	E	0.4	ug/kg	
RF2	3	Vermilion rockfish	muscle	Iron		4.62	mg/kg	0.096
RF2	3	Vermilion rockfish	muscle	Lipids		2.74	%wt	0.005
RF2	3	Vermilion rockfish	muscle	Manganese		0.128	mg/kg	0.007
RF2	3	Vermilion rockfish	muscle	Mercury		0.088	mg/kg	0.03
RF2	3	Vermilion rockfish	muscle	p,p-DDD	E	0.5	ug/kg	
RF2	3	Vermilion rockfish	muscle	p,p-DDE		25	ug/kg	1.33
RF2	3	Vermilion rockfish	muscle	p,p-DDT	E	0.4	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 101	E	0.4	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 105	E	0.3	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 110	E	0.4	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 118	E	0.6	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 138	E	0.7	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 149	E	0.7	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 153/168		1.5	ug/kg	1.33
RF2	3	Vermilion rockfish	muscle	PCB 180	E	0.4	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
RF2	3	Vermilion rockfish	muscle	PCB 183	E	0.2	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 187	E	0.5	ug/kg	
RF2	3	Vermilion rockfish	muscle	PCB 99	E	0.4	ug/kg	
RF2	3	Vermilion rockfish	muscle	Selenium		0.545	mg/kg	0.06
RF2	3	Vermilion rockfish	muscle	Tin		0.609	mg/kg	0.24
RF2	3	Vermilion rockfish	muscle	Total Solids		25.2	%wt	0.4
RF2	3	Vermilion rockfish	muscle	Zinc		4.69	mg/kg	0.049
TFZONE1	1	English sole	liver	Aluminum		4.96	mg/kg	0.583
TFZONE1	1	English sole	liver	Arsenic		5.62	mg/kg	0.375
TFZONE1	1	English sole	liver	Barium		0.095	mg/kg	0.007
TFZONE1	1	English sole	liver	Beryllium		0.004	mg/kg	0.003
TFZONE1	1	English sole	liver	Cadmium		0.642	mg/kg	0.029
TFZONE1	1	English sole	liver	Chromium		0.238	mg/kg	0.08
TFZONE1	1	English sole	liver	Copper		12.3	mg/kg	0.068
TFZONE1	1	English sole	liver	Hexachlorobenzene	E	1.5	ug/kg	
TFZONE1	1	English sole	liver	Iron		141	mg/kg	0.096
TFZONE1	1	English sole	liver	Lipids		17.9	%wt	0.005
TFZONE1	1	English sole	liver	Manganese		0.774	mg/kg	0.007
TFZONE1	1	English sole	liver	Mercury		0.054	mg/kg	0.03
TFZONE1	1	English sole	liver	Nickel		0.194	mg/kg	0.094
TFZONE1	1	English sole	liver	p,p-DDD	E	2.1	ug/kg	
TFZONE1	1	English sole	liver	p,p-DDE		96	ug/kg	13.3
TFZONE1	1	English sole	liver	PCB 101	E	3.4	ug/kg	
TFZONE1	1	English sole	liver	PCB 110	E	2.9	ug/kg	
TFZONE1	1	English sole	liver	PCB 118	E	5.2	ug/kg	
TFZONE1	1	English sole	liver	PCB 128	E	2	ug/kg	
TFZONE1	1	English sole	liver	PCB 138	E	10	ug/kg	
TFZONE1	1	English sole	liver	PCB 149	E	4.3	ug/kg	
TFZONE1	1	English sole	liver	PCB 153/168		15	ug/kg	13.3
TFZONE1	1	English sole	liver	PCB 180	E	6.4	ug/kg	
TFZONE1	1	English sole	liver	PCB 187	E	9.4	ug/kg	
TFZONE1	1	English sole	liver	PCB 99	E	3	ug/kg	
TFZONE1	1	English sole	liver	Selenium		2.51	mg/kg	0.06
TFZONE1	1	English sole	liver	Silver		0.319	mg/kg	0.057
TFZONE1	1	English sole	liver	Tin		1.04	mg/kg	0.24
TFZONE1	1	English sole	liver	Total Solids		39.1	%wt	0.4
TFZONE1	1	English sole	liver	Zinc		56.9	mg/kg	0.049
TFZONE1	2	English sole	liver	Aluminum		4.7	mg/kg	0.583
TFZONE1	2	English sole	liver	Arsenic		4.12	mg/kg	0.375
TFZONE1	2	English sole	liver	Barium		0.088	mg/kg	0.007
TFZONE1	2	English sole	liver	Beryllium		0.004	mg/kg	0.003
TFZONE1	2	English sole	liver	Cadmium		0.684	mg/kg	0.029
TFZONE1	2	English sole	liver	Chromium		0.242	mg/kg	0.08
TFZONE1	2	English sole	liver	Copper		5.41	mg/kg	0.068
TFZONE1	2	English sole	liver	Iron		105	mg/kg	0.096
TFZONE1	2	English sole	liver	Lipids		16.9	%wt	0.005
TFZONE1	2	English sole	liver	Manganese		0.684	mg/kg	0.007
TFZONE1	2	English sole	liver	Mercury		0.034	mg/kg	0.03
TFZONE1	2	English sole	liver	Nickel		0.18	mg/kg	0.094
TFZONE1	2	English sole	liver	o,p-DDE	E	2	ug/kg	
TFZONE1	2	English sole	liver	p,p-DDD	E	1.4	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE1	2	English sole	liver	p,p-DDE		80	ug/kg	13.3
TFZONE1	2	English sole	liver	p,p-DDT	E	2.5	ug/kg	
TFZONE1	2	English sole	liver	PCB 101	E	1.9	ug/kg	
TFZONE1	2	English sole	liver	PCB 118	E	3.4	ug/kg	
TFZONE1	2	English sole	liver	PCB 138	E	5.5	ug/kg	
TFZONE1	2	English sole	liver	PCB 149	E	3	ug/kg	
TFZONE1	2	English sole	liver	PCB 153/168	E	9.5	ug/kg	
TFZONE1	2	English sole	liver	PCB 180	E	5.7	ug/kg	
TFZONE1	2	English sole	liver	PCB 183	E	1.9	ug/kg	
TFZONE1	2	English sole	liver	PCB 187	E	6.7	ug/kg	
TFZONE1	2	English sole	liver	PCB 99	E	2	ug/kg	
TFZONE1	2	English sole	liver	Selenium		1.68	mg/kg	0.06
TFZONE1	2	English sole	liver	Silver		0.114	mg/kg	0.057
TFZONE1	2	English sole	liver	Tin		0.946	mg/kg	0.24
TFZONE1	2	English sole	liver	Total Solids		40.9	%wt	0.4
TFZONE1	2	English sole	liver	Zinc		31.5	mg/kg	0.049
TFZONE1	3	English sole	liver	Aluminum		8.3	mg/kg	0.583
TFZONE1	3	English sole	liver	Arsenic		6.94	mg/kg	0.375
TFZONE1	3	English sole	liver	Barium		0.11	mg/kg	0.007
TFZONE1	3	English sole	liver	Beryllium		0.004	mg/kg	0.003
TFZONE1	3	English sole	liver	Cadmium		0.768	mg/kg	0.029
TFZONE1	3	English sole	liver	Chromium		0.274	mg/kg	0.08
TFZONE1	3	English sole	liver	Copper		1.98	mg/kg	0.068
TFZONE1	3	English sole	liver	Hexachlorobenzene	E	2.2	ug/kg	
TFZONE1	3	English sole	liver	Iron		111	mg/kg	0.096
TFZONE1	3	English sole	liver	Lead		0.501	mg/kg	0.3
TFZONE1	3	English sole	liver	Lipids		20.4	%wt	0.005
TFZONE1	3	English sole	liver	Manganese		0.869	mg/kg	0.007
TFZONE1	3	English sole	liver	Mercury		0.078	mg/kg	0.03
TFZONE1	3	English sole	liver	Nickel		0.18	mg/kg	0.094
TFZONE1	3	English sole	liver	o,p-DDD	E	2.1	ug/kg	
TFZONE1	3	English sole	liver	o,p-DDE	E	5.4	ug/kg	
TFZONE1	3	English sole	liver	o,p-DDT	E	5.8	ug/kg	
TFZONE1	3	English sole	liver	p,p-DDD		14	ug/kg	13.3
TFZONE1	3	English sole	liver	p,p-DDE		240	ug/kg	13.3
TFZONE1	3	English sole	liver	p,p-DDT		30	ug/kg	13.3
TFZONE1	3	English sole	liver	PCB 101	E	7.7	ug/kg	
TFZONE1	3	English sole	liver	PCB 110	E	8.2	ug/kg	
TFZONE1	3	English sole	liver	PCB 118	E	12	ug/kg	
TFZONE1	3	English sole	liver	PCB 128	E	4.7	ug/kg	
TFZONE1	3	English sole	liver	PCB 138		24	ug/kg	13.3
TFZONE1	3	English sole	liver	PCB 149	E	13	ug/kg	
TFZONE1	3	English sole	liver	PCB 151	E	5	ug/kg	
TFZONE1	3	English sole	liver	PCB 153/168		36	ug/kg	13.3
TFZONE1	3	English sole	liver	PCB 158	E	1.7	ug/kg	
TFZONE1	3	English sole	liver	PCB 177	E	6.2	ug/kg	
TFZONE1	3	English sole	liver	PCB 180		22	ug/kg	13.3
TFZONE1	3	English sole	liver	PCB 183	E	8.1	ug/kg	
TFZONE1	3	English sole	liver	PCB 187		26	ug/kg	13.3
TFZONE1	3	English sole	liver	PCB 194	E	6.8	ug/kg	
TFZONE1	3	English sole	liver	PCB 201	E	11	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE1	3	English sole	liver	PCB 206	E	4.7	ug/kg	
TFZONE1	3	English sole	liver	PCB 66	E	1.6	ug/kg	
TFZONE1	3	English sole	liver	PCB 70	E	1.2	ug/kg	
TFZONE1	3	English sole	liver	PCB 87	E	2	ug/kg	
TFZONE1	3	English sole	liver	PCB 99	E	5.3	ug/kg	
TFZONE1	3	English sole	liver	Selenium		2.56	mg/kg	0.06
TFZONE1	3	English sole	liver	Silver		0.136	mg/kg	0.057
TFZONE1	3	English sole	liver	Tin		1.19	mg/kg	0.24
TFZONE1	3	English sole	liver	Total Solids		41.8	%wt	0.4
TFZONE1	3	English sole	liver	Zinc		61.8	mg/kg	0.049
TFZONE1	4	Pacific sanddab	liver	Alpha (cis) Chlordane	E	5.6	ug/kg	
TFZONE1	4	Pacific sanddab	liver	Aluminum		9.15	mg/kg	0.583
TFZONE1	4	Pacific sanddab	liver	Arsenic		2.86	mg/kg	0.375
TFZONE1	4	Pacific sanddab	liver	Barium		0.117	mg/kg	0.007
TFZONE1	4	Pacific sanddab	liver	Beryllium		0.004	mg/kg	0.003
TFZONE1	4	Pacific sanddab	liver	Cadmium		6.19	mg/kg	0.029
TFZONE1	4	Pacific sanddab	liver	Chromium		0.274	mg/kg	0.08
TFZONE1	4	Pacific sanddab	liver	Copper		3.92	mg/kg	0.068
TFZONE1	4	Pacific sanddab	liver	Hexachlorobenzene	E	5.9	ug/kg	
TFZONE1	4	Pacific sanddab	liver	Iron		68	mg/kg	0.096
TFZONE1	4	Pacific sanddab	liver	Lipids		26.3	%wt	0.005
TFZONE1	4	Pacific sanddab	liver	Manganese		1.05	mg/kg	0.007
TFZONE1	4	Pacific sanddab	liver	Mercury		0.084	mg/kg	0.03
TFZONE1	4	Pacific sanddab	liver	Nickel		0.137	mg/kg	0.094
TFZONE1	4	Pacific sanddab	liver	o,p-DDE	E	3.4	ug/kg	
TFZONE1	4	Pacific sanddab	liver	o,p-DDT	E	2.6	ug/kg	
TFZONE1	4	Pacific sanddab	liver	p,p-DDD	E	7.5	ug/kg	
TFZONE1	4	Pacific sanddab	liver	p,p-DDE		470	ug/kg	13.3
TFZONE1	4	Pacific sanddab	liver	p,p-DDT		14	ug/kg	13.3
TFZONE1	4	Pacific sanddab	liver	PCB 101	E	7.7	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 105	E	4	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 110	E	8.7	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 118		17	ug/kg	13.3
TFZONE1	4	Pacific sanddab	liver	PCB 123	E	1.7	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 128	E	4.2	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 138		23	ug/kg	13.3
TFZONE1	4	Pacific sanddab	liver	PCB 149	E	5.2	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 151	E	3.7	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 153/168		36	ug/kg	13.3
TFZONE1	4	Pacific sanddab	liver	PCB 158	E	1.3	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 180	E	12	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 183	E	2.9	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 187	E	13	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 52	E	3.1	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 70	E	2.4	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 87	E	2	ug/kg	
TFZONE1	4	Pacific sanddab	liver	PCB 99	E	7.5	ug/kg	
TFZONE1	4	Pacific sanddab	liver	Selenium		1.13	mg/kg	0.06
TFZONE1	4	Pacific sanddab	liver	Tin		1.35	mg/kg	0.24
TFZONE1	4	Pacific sanddab	liver	Total Solids		49.6	%wt	0.4
TFZONE1	4	Pacific sanddab	liver	Trans Nonachlor	E	7	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE1	4	Pacific sanddab	liver	Zinc		28.1	mg/kg	0.049
TFZONE1	5	Pacific sanddab	liver	Alpha (cis) Chlordane	E	5.2	ug/kg	
TFZONE1	5	Pacific sanddab	liver	Aluminum		5.44	mg/kg	0.583
TFZONE1	5	Pacific sanddab	liver	Arsenic		2.58	mg/kg	0.375
TFZONE1	5	Pacific sanddab	liver	Barium		0.099	mg/kg	0.007
TFZONE1	5	Pacific sanddab	liver	BHC, Alpha isomer	E	6.8	ug/kg	
TFZONE1	5	Pacific sanddab	liver	Cadmium		6.73	mg/kg	0.029
TFZONE1	5	Pacific sanddab	liver	Chromium		0.237	mg/kg	0.08
TFZONE1	5	Pacific sanddab	liver	Copper		5.87	mg/kg	0.068
TFZONE1	5	Pacific sanddab	liver	Hexachlorobenzene	E	5.9	ug/kg	
TFZONE1	5	Pacific sanddab	liver	Iron		101	mg/kg	0.096
TFZONE1	5	Pacific sanddab	liver	Lipids		27.9	%wt	0.005
TFZONE1	5	Pacific sanddab	liver	Manganese		0.863	mg/kg	0.007
TFZONE1	5	Pacific sanddab	liver	Mercury		0.057	mg/kg	0.03
TFZONE1	5	Pacific sanddab	liver	Nickel		0.117	mg/kg	0.094
TFZONE1	5	Pacific sanddab	liver	o,p-DDE	E	2	ug/kg	
TFZONE1	5	Pacific sanddab	liver	o,p-DDT	E	1.5	ug/kg	
TFZONE1	5	Pacific sanddab	liver	p,p-DDD	E	6.2	ug/kg	
TFZONE1	5	Pacific sanddab	liver	p,p-DDE		440	ug/kg	13.3
TFZONE1	5	Pacific sanddab	liver	p,p-DDT	E	11	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 101	E	8.3	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 105	E	4.6	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 110	E	9.9	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 118		15	ug/kg	13.3
TFZONE1	5	Pacific sanddab	liver	PCB 123	E	1.7	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 128	E	4.5	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 138		21	ug/kg	13.3
TFZONE1	5	Pacific sanddab	liver	PCB 149	E	5.5	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 151	E	3.7	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 153/168		36	ug/kg	13.3
TFZONE1	5	Pacific sanddab	liver	PCB 180	E	12	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 183	E	3.8	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 187	E	13	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 28	E	1.3	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 52	E	2.9	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 66	E	2	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 70	E	2.8	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 87	E	2.1	ug/kg	
TFZONE1	5	Pacific sanddab	liver	PCB 99	E	8.2	ug/kg	
TFZONE1	5	Pacific sanddab	liver	Selenium		0.885	mg/kg	0.06
TFZONE1	5	Pacific sanddab	liver	Silver		0.095	mg/kg	0.057
TFZONE1	5	Pacific sanddab	liver	Tin		90.5	mg/kg	0.24
TFZONE1	5	Pacific sanddab	liver	Total Solids		48.9	%wt	0.4
TFZONE1	5	Pacific sanddab	liver	Trans Nonachlor	E	7.8	ug/kg	
TFZONE1	5	Pacific sanddab	liver	Zinc		24.3	mg/kg	0.049
TFZONE1	6	Pacific sanddab	liver	Aluminum		8.54	mg/kg	0.583
TFZONE1	6	Pacific sanddab	liver	Arsenic		3.7	mg/kg	0.375
TFZONE1	6	Pacific sanddab	liver	Barium		0.146	mg/kg	0.007
TFZONE1	6	Pacific sanddab	liver	Beryllium		0.004	mg/kg	0.003
TFZONE1	6	Pacific sanddab	liver	Cadmium		6.55	mg/kg	0.029
TFZONE1	6	Pacific sanddab	liver	Chromium		0.314	mg/kg	0.08

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE1	6	Pacific sanddab	liver	Copper		6.61	mg/kg	0.068
TFZONE1	6	Pacific sanddab	liver	Hexachlorobenzene	E	4.9	ug/kg	
TFZONE1	6	Pacific sanddab	liver	Iron		69	mg/kg	0.096
TFZONE1	6	Pacific sanddab	liver	Lipids		25.8	%wt	0.005
TFZONE1	6	Pacific sanddab	liver	Manganese		0.792	mg/kg	0.007
TFZONE1	6	Pacific sanddab	liver	Mercury		0.04	mg/kg	0.03
TFZONE1	6	Pacific sanddab	liver	Nickel		0.168	mg/kg	0.094
TFZONE1	6	Pacific sanddab	liver	o,p-DDE	E	3.4	ug/kg	
TFZONE1	6	Pacific sanddab	liver	o,p-DDT	E	2	ug/kg	
TFZONE1	6	Pacific sanddab	liver	p,p-DDD	E	5.5	ug/kg	
TFZONE1	6	Pacific sanddab	liver	p,p-DDE		590	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	p,p-DDT	E	12	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 101	E	9.4	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 105	E	5.8	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 110	E	11	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 118		19	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 123	E	2.6	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 128	E	6	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 138		29	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 149	E	3.8	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 151	E	4.6	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 153/168		44	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 158	E	1.8	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 180		17	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 183	E	5.4	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 187		18	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 28		390	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 44		82	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 49		130	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 52		190	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 66		34	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 70		53	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 74		32	ug/kg	13.3
TFZONE1	6	Pacific sanddab	liver	PCB 87	E	2.2	ug/kg	
TFZONE1	6	Pacific sanddab	liver	PCB 99	E	12	ug/kg	
TFZONE1	6	Pacific sanddab	liver	Selenium		0.659	mg/kg	0.06
TFZONE1	6	Pacific sanddab	liver	Silver		0.095	mg/kg	0.057
TFZONE1	6	Pacific sanddab	liver	Tin		1.96	mg/kg	0.24
TFZONE1	6	Pacific sanddab	liver	Total Solids		53.2	%wt	0.4
TFZONE1	6	Pacific sanddab	liver	Trans Nonachlor	E	6.7	ug/kg	
TFZONE1	6	Pacific sanddab	liver	Zinc		24.5	mg/kg	0.049
TFZONE1	7	Hornyhead turbot	liver	Aluminum		7.43	mg/kg	0.583
TFZONE1	7	Hornyhead turbot	liver	Arsenic		4.79	mg/kg	0.375
TFZONE1	7	Hornyhead turbot	liver	Barium		0.103	mg/kg	0.007
TFZONE1	7	Hornyhead turbot	liver	Cadmium		5.07	mg/kg	0.029
TFZONE1	7	Hornyhead turbot	liver	Chromium		0.266	mg/kg	0.08
TFZONE1	7	Hornyhead turbot	liver	Copper		5.74	mg/kg	0.068
TFZONE1	7	Hornyhead turbot	liver	Hexachlorobenzene	E	1.7	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	Iron		109	mg/kg	0.096
TFZONE1	7	Hornyhead turbot	liver	Lipids		14.3	%wt	0.005
TFZONE1	7	Hornyhead turbot	liver	Manganese		0.585	mg/kg	0.007

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE1	7	Hornyhead turbot	liver	Mercury		0.137	mg/kg	0.03
TFZONE1	7	Hornyhead turbot	liver	Nickel		0.198	mg/kg	0.094
TFZONE1	7	Hornyhead turbot	liver	p,p-DDD	E	11	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	p,p-DDE		230	ug/kg	13.3
TFZONE1	7	Hornyhead turbot	liver	p,p-DDT	E	11	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 101	E	4.5	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 118	E	8.8	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 128	E	2.5	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 138		16	ug/kg	13.3
TFZONE1	7	Hornyhead turbot	liver	PCB 149	E	4	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 153/168		29	ug/kg	13.3
TFZONE1	7	Hornyhead turbot	liver	PCB 158	E	0.9	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 180	E	12	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 183	E	5.6	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	PCB 187		21	ug/kg	13.3
TFZONE1	7	Hornyhead turbot	liver	PCB 99	E	4.2	ug/kg	
TFZONE1	7	Hornyhead turbot	liver	Selenium		0.888	mg/kg	0.06
TFZONE1	7	Hornyhead turbot	liver	Silver		0.27	mg/kg	0.057
TFZONE1	7	Hornyhead turbot	liver	Tin		1.17	mg/kg	0.24
TFZONE1	7	Hornyhead turbot	liver	Total Solids		37	%wt	0.4
TFZONE1	7	Hornyhead turbot	liver	Zinc		65.1	mg/kg	0.049
TFZONE1	8	Hornyhead turbot	liver	Hexachlorobenzene	E	2	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	Lipids		17.5	%wt	0.005
TFZONE1	8	Hornyhead turbot	liver	p,p-DDD	E	4.5	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	p,p-DDE		170	ug/kg	13.3
TFZONE1	8	Hornyhead turbot	liver	PCB 101	E	6.6	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	PCB 110	E	9	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	PCB 118	E	11	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	PCB 128	E	2.3	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	PCB 138		16	ug/kg	13.3
TFZONE1	8	Hornyhead turbot	liver	PCB 149	E	12	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	PCB 151	E	4.2	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	PCB 153/168		36	ug/kg	13.3
TFZONE1	8	Hornyhead turbot	liver	PCB 180		18	ug/kg	13.3
TFZONE1	8	Hornyhead turbot	liver	PCB 183	E	7.9	ug/kg	
TFZONE1	8	Hornyhead turbot	liver	PCB 187		27	ug/kg	13.3
TFZONE1	8	Hornyhead turbot	liver	PCB 99	E	5.8	ug/kg	
TFZONE2	1	Longfin sanddab	liver	Alpha (cis) Chlordane	E	6.8	ug/kg	
TFZONE2	1	Longfin sanddab	liver	Aluminum		8.75	mg/kg	0.583
TFZONE2	1	Longfin sanddab	liver	Arsenic		18.5	mg/kg	0.375
TFZONE2	1	Longfin sanddab	liver	Barium		0.102	mg/kg	0.007
TFZONE2	1	Longfin sanddab	liver	Beryllium		0.005	mg/kg	0.003
TFZONE2	1	Longfin sanddab	liver	Cadmium		3	mg/kg	0.029
TFZONE2	1	Longfin sanddab	liver	Chromium		0.309	mg/kg	0.08
TFZONE2	1	Longfin sanddab	liver	Copper		7.09	mg/kg	0.068
TFZONE2	1	Longfin sanddab	liver	Hexachlorobenzene	E	6.9	ug/kg	
TFZONE2	1	Longfin sanddab	liver	Iron		198	mg/kg	0.096
TFZONE2	1	Longfin sanddab	liver	Lipids		31.7	%wt	0.005
TFZONE2	1	Longfin sanddab	liver	Manganese		0.918	mg/kg	0.007
TFZONE2	1	Longfin sanddab	liver	Mercury		0.165	mg/kg	0.03
TFZONE2	1	Longfin sanddab	liver	Mirex	E	2.3	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	1	Longfin sanddab	liver	Nickel		0.169	mg/kg	0.094
TFZONE2	1	Longfin sanddab	liver	o,p-DDE		23	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	o,p-DDT	E	2	ug/kg	
TFZONE2	1	Longfin sanddab	liver	p,p-DDD	E	12	ug/kg	
TFZONE2	1	Longfin sanddab	liver	p,p-DDE		1100	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	p,p-DDT		21	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 101		18	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 105		16	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 110		22	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 118		56	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 123	E	7.1	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 128		23	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 138		84	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 149		21	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 151		16	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 153/168		170	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 156	E	9.9	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 158	E	7.7	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 167	E	4.5	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 170		33	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 177		18	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 180		70	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 183		21	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 187		72	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 194		19	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 201		29	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	PCB 206	E	13	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 52	E	4.2	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 66	E	5.9	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 70	E	2.6	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 74	E	3.2	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 87	E	3	ug/kg	
TFZONE2	1	Longfin sanddab	liver	PCB 99		26	ug/kg	13.3
TFZONE2	1	Longfin sanddab	liver	Selenium		3.09	mg/kg	0.06
TFZONE2	1	Longfin sanddab	liver	Silver		0.269	mg/kg	0.057
TFZONE2	1	Longfin sanddab	liver	Tin		1.24	mg/kg	0.24
TFZONE2	1	Longfin sanddab	liver	Total Solids		44.7	%wt	0.4
TFZONE2	1	Longfin sanddab	liver	Trans Nonachlor	E	18	ug/kg	
TFZONE2	1	Longfin sanddab	liver	Zinc		25.2	mg/kg	0.049
TFZONE2	2	Longfin sanddab	liver	Alpha (cis) Chlordane	E	7.3	ug/kg	
TFZONE2	2	Longfin sanddab	liver	Aluminum		6.39	mg/kg	0.583
TFZONE2	2	Longfin sanddab	liver	Arsenic		12.7	mg/kg	0.375
TFZONE2	2	Longfin sanddab	liver	Barium		0.101	mg/kg	0.007
TFZONE2	2	Longfin sanddab	liver	Beryllium		0.005	mg/kg	0.003
TFZONE2	2	Longfin sanddab	liver	Cadmium		3.31	mg/kg	0.029
TFZONE2	2	Longfin sanddab	liver	Chromium		0.291	mg/kg	0.08
TFZONE2	2	Longfin sanddab	liver	Copper		6.29	mg/kg	0.068
TFZONE2	2	Longfin sanddab	liver	Hexachlorobenzene	E	5.1	ug/kg	
TFZONE2	2	Longfin sanddab	liver	Iron		174	mg/kg	0.096
TFZONE2	2	Longfin sanddab	liver	Lipids		28.1	%wt	0.005
TFZONE2	2	Longfin sanddab	liver	Manganese		0.969	mg/kg	0.007

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	2	Longfin sanddab	liver	Mercury		0.047	mg/kg	0.03
TFZONE2	2	Longfin sanddab	liver	Mirex	E	3	ug/kg	
TFZONE2	2	Longfin sanddab	liver	Nickel		0.168	mg/kg	0.094
TFZONE2	2	Longfin sanddab	liver	o,p-DDE		17	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	p,p-DDD	E	8.5	ug/kg	
TFZONE2	2	Longfin sanddab	liver	p,p-DDE		900	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	p,p-DDT	E	12	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 101	E	11	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 105		15	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 110		18	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 118		54	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 123	E	5.5	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 128		23	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 138		86	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 149		14	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 151		14	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 153/168		160	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 156	E	9.3	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 158	E	7.2	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 167	E	4.2	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 170		31	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 177		16	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 180		73	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 183		24	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 187		75	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 194		22	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 201		29	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	PCB 206	E	13	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 28	E	3	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 66	E	5.1	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 70	E	2.3	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 74	E	2.9	ug/kg	
TFZONE2	2	Longfin sanddab	liver	PCB 99		25	ug/kg	13.3
TFZONE2	2	Longfin sanddab	liver	Selenium		3.68	mg/kg	0.06
TFZONE2	2	Longfin sanddab	liver	Silver		0.248	mg/kg	0.057
TFZONE2	2	Longfin sanddab	liver	Tin		1.25	mg/kg	0.24
TFZONE2	2	Longfin sanddab	liver	Total Solids		42.5	%wt	0.4
TFZONE2	2	Longfin sanddab	liver	Trans Nonachlor	E	13	ug/kg	
TFZONE2	2	Longfin sanddab	liver	Zinc		27	mg/kg	0.049
TFZONE2	3	Longfin sanddab	liver	Alpha (cis) Chlordane		17	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	Aluminum		11.2	mg/kg	0.583
TFZONE2	3	Longfin sanddab	liver	Arsenic		8.28	mg/kg	0.375
TFZONE2	3	Longfin sanddab	liver	Barium		0.139	mg/kg	0.007
TFZONE2	3	Longfin sanddab	liver	Beryllium		0.006	mg/kg	0.003
TFZONE2	3	Longfin sanddab	liver	Cadmium		1.86	mg/kg	0.029
TFZONE2	3	Longfin sanddab	liver	Chromium		0.328	mg/kg	0.08
TFZONE2	3	Longfin sanddab	liver	Cis Nonachlor	E	11	ug/kg	
TFZONE2	3	Longfin sanddab	liver	Copper		4.88	mg/kg	0.068
TFZONE2	3	Longfin sanddab	liver	Gamma (trans) Chlordane	E	4.8	ug/kg	
TFZONE2	3	Longfin sanddab	liver	Hexachlorobenzene	E	7.5	ug/kg	
TFZONE2	3	Longfin sanddab	liver	Iron		153	mg/kg	0.096

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	3	Longfin sanddab	liver	Lipids		43.4	%wt	0.005
TFZONE2	3	Longfin sanddab	liver	Manganese		0.656	mg/kg	0.007
TFZONE2	3	Longfin sanddab	liver	Mercury		0.068	mg/kg	0.03
TFZONE2	3	Longfin sanddab	liver	Mirex	E	1.7	ug/kg	
TFZONE2	3	Longfin sanddab	liver	Nickel		0.184	mg/kg	0.094
TFZONE2	3	Longfin sanddab	liver	o,p-DDE		27	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	o,p-DDT	E	2.7	ug/kg	
TFZONE2	3	Longfin sanddab	liver	p,p-DDD		15	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	p,p-DDE		1000	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	p,p-DDT		17	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 101		17	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 105		16	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 110		24	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 118		52	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 123	E	6.4	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 128		23	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 138		100	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 149		24	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 151		16	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 153/168		170	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 156	E	9.7	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 157	E	2.7	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 158	E	8.5	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 167	E	5.1	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 170		30	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 177		18	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 180		78	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 183		24	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 187		80	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 194		21	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 201		27	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	PCB 206	E	12	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 28	E	3.3	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 66	E	6.3	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 70	E	2.7	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 74	E	3.2	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 87	E	4.2	ug/kg	
TFZONE2	3	Longfin sanddab	liver	PCB 99		28	ug/kg	13.3
TFZONE2	3	Longfin sanddab	liver	Selenium		2.57	mg/kg	0.06
TFZONE2	3	Longfin sanddab	liver	Silver		0.176	mg/kg	0.057
TFZONE2	3	Longfin sanddab	liver	Tin		1.58	mg/kg	0.24
TFZONE2	3	Longfin sanddab	liver	Total Solids		58.2	%wt	0.4
TFZONE2	3	Longfin sanddab	liver	Trans Nonachlor		23	ug/kg	20
TFZONE2	3	Longfin sanddab	liver	Zinc		20.3	mg/kg	0.049
TFZONE2	4	English sole	liver	Aluminum		7.35	mg/kg	0.583
TFZONE2	4	English sole	liver	Arsenic		5.47	mg/kg	0.375
TFZONE2	4	English sole	liver	Barium		0.096	mg/kg	0.007
TFZONE2	4	English sole	liver	Beryllium		0.005	mg/kg	0.003
TFZONE2	4	English sole	liver	Cadmium		0.731	mg/kg	0.029
TFZONE2	4	English sole	liver	Chromium		0.236	mg/kg	0.08
TFZONE2	4	English sole	liver	Copper		5.12	mg/kg	0.068

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	4	English sole	liver	Hexachlorobenzene	E	2.4	ug/kg	
TFZONE2	4	English sole	liver	Iron		139	mg/kg	0.096
TFZONE2	4	English sole	liver	Lipids		21.4	%wt	0.005
TFZONE2	4	English sole	liver	Manganese		0.988	mg/kg	0.007
TFZONE2	4	English sole	liver	Mercury		0.068	mg/kg	0.03
TFZONE2	4	English sole	liver	Nickel		0.169	mg/kg	0.094
TFZONE2	4	English sole	liver	p,p-DDD	E	5.8	ug/kg	
TFZONE2	4	English sole	liver	p,p-DDE		170	ug/kg	13.3
TFZONE2	4	English sole	liver	p,p-DDT	E	2.9	ug/kg	
TFZONE2	4	English sole	liver	PCB 101	E	4.2	ug/kg	
TFZONE2	4	English sole	liver	PCB 105	E	1.8	ug/kg	
TFZONE2	4	English sole	liver	PCB 110	E	5.5	ug/kg	
TFZONE2	4	English sole	liver	PCB 118	E	8.2	ug/kg	
TFZONE2	4	English sole	liver	PCB 128	E	3	ug/kg	
TFZONE2	4	English sole	liver	PCB 138		14	ug/kg	13.3
TFZONE2	4	English sole	liver	PCB 149	E	8.4	ug/kg	
TFZONE2	4	English sole	liver	PCB 151	E	2.2	ug/kg	
TFZONE2	4	English sole	liver	PCB 153/168		24	ug/kg	13.3
TFZONE2	4	English sole	liver	PCB 180		14	ug/kg	13.3
TFZONE2	4	English sole	liver	PCB 183	E	5.6	ug/kg	
TFZONE2	4	English sole	liver	PCB 187		17	ug/kg	13.3
TFZONE2	4	English sole	liver	PCB 194	E	6	ug/kg	
TFZONE2	4	English sole	liver	PCB 206	E	4.2	ug/kg	
TFZONE2	4	English sole	liver	PCB 66	E	1.5	ug/kg	
TFZONE2	4	English sole	liver	PCB 99	E	4.9	ug/kg	
TFZONE2	4	English sole	liver	Selenium		2.46	mg/kg	0.06
TFZONE2	4	English sole	liver	Silver		0.221	mg/kg	0.057
TFZONE2	4	English sole	liver	Tin		1.03	mg/kg	0.24
TFZONE2	4	English sole	liver	Total Solids		39.6	%wt	0.4
TFZONE2	4	English sole	liver	Zinc		80	mg/kg	0.049
TFZONE2	5	English sole	liver	Aluminum		4.91	mg/kg	0.583
TFZONE2	5	English sole	liver	Arsenic		7.87	mg/kg	0.375
TFZONE2	5	English sole	liver	Barium		0.083	mg/kg	0.007
TFZONE2	5	English sole	liver	Beryllium		0.004	mg/kg	0.003
TFZONE2	5	English sole	liver	Cadmium		0.738	mg/kg	0.029
TFZONE2	5	English sole	liver	Chromium		0.244	mg/kg	0.08
TFZONE2	5	English sole	liver	Copper		4.47	mg/kg	0.068
TFZONE2	5	English sole	liver	Iron		121	mg/kg	0.096
TFZONE2	5	English sole	liver	Lead		0.877	mg/kg	0.3
TFZONE2	5	English sole	liver	Lipids		14.1	%wt	0.005
TFZONE2	5	English sole	liver	Manganese		1.31	mg/kg	0.007
TFZONE2	5	English sole	liver	Mercury		0.064	mg/kg	0.03
TFZONE2	5	English sole	liver	Nickel		0.172	mg/kg	0.094
TFZONE2	5	English sole	liver	o,p-DDE	E	3.8	ug/kg	
TFZONE2	5	English sole	liver	p,p-DDD	E	4	ug/kg	
TFZONE2	5	English sole	liver	p,p-DDE		130	ug/kg	13.3
TFZONE2	5	English sole	liver	p,p-DDT	E	2	ug/kg	
TFZONE2	5	English sole	liver	PCB 101	E	4.2	ug/kg	
TFZONE2	5	English sole	liver	PCB 110	E	4.7	ug/kg	
TFZONE2	5	English sole	liver	PCB 118	E	6.7	ug/kg	
TFZONE2	5	English sole	liver	PCB 128	E	2.9	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	5	English sole	liver	PCB 138	E	11	ug/kg	
TFZONE2	5	English sole	liver	PCB 149	E	7.3	ug/kg	
TFZONE2	5	English sole	liver	PCB 153/168		20	ug/kg	13.3
TFZONE2	5	English sole	liver	PCB 180	E	11	ug/kg	
TFZONE2	5	English sole	liver	PCB 183	E	4.2	ug/kg	
TFZONE2	5	English sole	liver	PCB 187	E	13	ug/kg	
TFZONE2	5	English sole	liver	PCB 206	E	3.4	ug/kg	
TFZONE2	5	English sole	liver	PCB 66	E	1.4	ug/kg	
TFZONE2	5	English sole	liver	PCB 99	E	4.1	ug/kg	
TFZONE2	5	English sole	liver	Selenium		2.68	mg/kg	0.06
TFZONE2	5	English sole	liver	Silver		0.3	mg/kg	0.057
TFZONE2	5	English sole	liver	Tin		0.952	mg/kg	0.24
TFZONE2	5	English sole	liver	Total Solids		34.5	%wt	0.4
TFZONE2	5	English sole	liver	Zinc		63.1	mg/kg	0.049
TFZONE2	6	English sole	liver	Aluminum		5.99	mg/kg	0.583
TFZONE2	6	English sole	liver	Arsenic		6.05	mg/kg	0.375
TFZONE2	6	English sole	liver	Barium		0.1	mg/kg	0.007
TFZONE2	6	English sole	liver	Beryllium		0.005	mg/kg	0.003
TFZONE2	6	English sole	liver	Cadmium		0.594	mg/kg	0.029
TFZONE2	6	English sole	liver	Chromium		0.277	mg/kg	0.08
TFZONE2	6	English sole	liver	Copper		0.996	mg/kg	0.068
TFZONE2	6	English sole	liver	Hexachlorobenzene	E	2.7	ug/kg	
TFZONE2	6	English sole	liver	Iron		143	mg/kg	0.096
TFZONE2	6	English sole	liver	Lipids		25.4	%wt	0.005
TFZONE2	6	English sole	liver	Manganese		1.01	mg/kg	0.007
TFZONE2	6	English sole	liver	Nickel		0.173	mg/kg	0.094
TFZONE2	6	English sole	liver	o,p-DDD	E	2.2	ug/kg	
TFZONE2	6	English sole	liver	o,p-DDE	E	7	ug/kg	
TFZONE2	6	English sole	liver	p,p-DDD	E	6	ug/kg	
TFZONE2	6	English sole	liver	p,p-DDE		260	ug/kg	13.3
TFZONE2	6	English sole	liver	p,p-DDT	E	2.5	ug/kg	
TFZONE2	6	English sole	liver	PCB 101	E	7.7	ug/kg	
TFZONE2	6	English sole	liver	PCB 105	E	4.1	ug/kg	
TFZONE2	6	English sole	liver	PCB 110	E	8.4	ug/kg	
TFZONE2	6	English sole	liver	PCB 118		14	ug/kg	13.3
TFZONE2	6	English sole	liver	PCB 128	E	6.6	ug/kg	
TFZONE2	6	English sole	liver	PCB 138		23	ug/kg	13.3
TFZONE2	6	English sole	liver	PCB 149		14	ug/kg	13.3
TFZONE2	6	English sole	liver	PCB 151	E	4.1	ug/kg	
TFZONE2	6	English sole	liver	PCB 153/168		38	ug/kg	13.3
TFZONE2	6	English sole	liver	PCB 158	E	2.2	ug/kg	
TFZONE2	6	English sole	liver	PCB 170	E	9.4	ug/kg	
TFZONE2	6	English sole	liver	PCB 177	E	6.4	ug/kg	
TFZONE2	6	English sole	liver	PCB 180		23	ug/kg	13.3
TFZONE2	6	English sole	liver	PCB 183	E	6.9	ug/kg	
TFZONE2	6	English sole	liver	PCB 187		26	ug/kg	13.3
TFZONE2	6	English sole	liver	PCB 194	E	7.8	ug/kg	
TFZONE2	6	English sole	liver	PCB 206	E	6.2	ug/kg	
TFZONE2	6	English sole	liver	PCB 87	E	1.7	ug/kg	
TFZONE2	6	English sole	liver	PCB 99	E	6.7	ug/kg	
TFZONE2	6	English sole	liver	Selenium		3.01	mg/kg	0.06

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	6	English sole	liver	Silver		0.064	mg/kg	0.057
TFZONE2	6	English sole	liver	Tin		1.29	mg/kg	0.24
TFZONE2	6	English sole	liver	Total Solids		39.4	%wt	0.4
TFZONE2	6	English sole	liver	Zinc		42.7	mg/kg	0.049
TFZONE2	7	Pacific sanddab	liver	Alpha (cis) Chlordane	E	8.4	ug/kg	
TFZONE2	7	Pacific sanddab	liver	Aluminum		7.48	mg/kg	0.583
TFZONE2	7	Pacific sanddab	liver	Arsenic		3.68	mg/kg	0.375
TFZONE2	7	Pacific sanddab	liver	Barium		0.119	mg/kg	0.007
TFZONE2	7	Pacific sanddab	liver	Beryllium		0.006	mg/kg	0.003
TFZONE2	7	Pacific sanddab	liver	Cadmium		5.29	mg/kg	0.029
TFZONE2	7	Pacific sanddab	liver	Chromium		0.387	mg/kg	0.08
TFZONE2	7	Pacific sanddab	liver	Copper		5	mg/kg	0.068
TFZONE2	7	Pacific sanddab	liver	Hexachlorobenzene	E	8.8	ug/kg	
TFZONE2	7	Pacific sanddab	liver	Iron		67.3	mg/kg	0.096
TFZONE2	7	Pacific sanddab	liver	Lipids		44.7	%wt	0.005
TFZONE2	7	Pacific sanddab	liver	Manganese		1.07	mg/kg	0.007
TFZONE2	7	Pacific sanddab	liver	Mercury		0.051	mg/kg	0.03
TFZONE2	7	Pacific sanddab	liver	Nickel		0.204	mg/kg	0.094
TFZONE2	7	Pacific sanddab	liver	o,p-DDE	E	6.9	ug/kg	
TFZONE2	7	Pacific sanddab	liver	o,p-DDT	E	2.4	ug/kg	
TFZONE2	7	Pacific sanddab	liver	p,p-DDD	E	9.2	ug/kg	
TFZONE2	7	Pacific sanddab	liver	p,p-DDE		490	ug/kg	13.3
TFZONE2	7	Pacific sanddab	liver	p,p-DDT	E	10	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 101	E	8.3	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 105	E	4.9	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 110	E	11	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 118		18	ug/kg	13.3
TFZONE2	7	Pacific sanddab	liver	PCB 123	E	2.2	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 128	E	5.1	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 138		26	ug/kg	13.3
TFZONE2	7	Pacific sanddab	liver	PCB 149	E	7.7	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 151	E	3.9	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 153/168		45	ug/kg	13.3
TFZONE2	7	Pacific sanddab	liver	PCB 170	E	5.9	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 177	E	3	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 180		19	ug/kg	13.3
TFZONE2	7	Pacific sanddab	liver	PCB 183	E	3.6	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 187		17	ug/kg	13.3
TFZONE2	7	Pacific sanddab	liver	PCB 201	E	4.9	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 28	E	1.2	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 66	E	1.9	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 70	E	2.9	ug/kg	
TFZONE2	7	Pacific sanddab	liver	PCB 99	E	8.6	ug/kg	
TFZONE2	7	Pacific sanddab	liver	Selenium		0.938	mg/kg	0.06
TFZONE2	7	Pacific sanddab	liver	Silver		0.085	mg/kg	0.057
TFZONE2	7	Pacific sanddab	liver	Tin		1.31	mg/kg	0.24
TFZONE2	7	Pacific sanddab	liver	Total Solids		52.7	%wt	0.4
TFZONE2	7	Pacific sanddab	liver	Zinc		25.6	mg/kg	0.049
TFZONE2	8	Pacific sanddab	liver	Alpha (cis) Chlordane	E	9.8	ug/kg	
TFZONE2	8	Pacific sanddab	liver	Aluminum		7.22	mg/kg	0.583
TFZONE2	8	Pacific sanddab	liver	Arsenic		3.6	mg/kg	0.375

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	8	Pacific sanddab	liver	Barium		0.106	mg/kg	0.007
TFZONE2	8	Pacific sanddab	liver	Beryllium		0.004	mg/kg	0.003
TFZONE2	8	Pacific sanddab	liver	Cadmium		7.4	mg/kg	0.029
TFZONE2	8	Pacific sanddab	liver	Chromium		0.257	mg/kg	0.08
TFZONE2	8	Pacific sanddab	liver	Copper		6.64	mg/kg	0.068
TFZONE2	8	Pacific sanddab	liver	Hexachlorobenzene	E	8.1	ug/kg	
TFZONE2	8	Pacific sanddab	liver	Iron		93.3	mg/kg	0.096
TFZONE2	8	Pacific sanddab	liver	Lipids		33.3	%wt	0.005
TFZONE2	8	Pacific sanddab	liver	Manganese		1.03	mg/kg	0.007
TFZONE2	8	Pacific sanddab	liver	Mercury		0.064	mg/kg	0.03
TFZONE2	8	Pacific sanddab	liver	Nickel		0.174	mg/kg	0.094
TFZONE2	8	Pacific sanddab	liver	o,p-DDE	E	6.4	ug/kg	
TFZONE2	8	Pacific sanddab	liver	o,p-DDT	E	3.3	ug/kg	
TFZONE2	8	Pacific sanddab	liver	p,p-DDD	E	11	ug/kg	
TFZONE2	8	Pacific sanddab	liver	p,p-DDE		760	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	p,p-DDT		17	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 101		14	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	PCB 105	E	6.8	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 110		16	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	PCB 118		34	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	PCB 123	E	3.8	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 128	E	13	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 138		44	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	PCB 149	E	8.9	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 151	E	8.3	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 153/168		80	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	PCB 156	E	2.3	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 167	E	2.2	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 170	E	9.8	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 177	E	5.8	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 180		31	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	PCB 183	E	8.7	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 187		30	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	PCB 194	E	7.2	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 206	E	2.5	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 28	E	1.9	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 52	E	4.6	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 66	E	3.7	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 70	E	4	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 74	E	2.2	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 87	E	4.7	ug/kg	
TFZONE2	8	Pacific sanddab	liver	PCB 99		20	ug/kg	13.3
TFZONE2	8	Pacific sanddab	liver	Selenium		1.11	mg/kg	0.06
TFZONE2	8	Pacific sanddab	liver	Silver		0.085	mg/kg	0.057
TFZONE2	8	Pacific sanddab	liver	Tin		1.46	mg/kg	0.24
TFZONE2	8	Pacific sanddab	liver	Total Solids		43.3	%wt	0.4
TFZONE2	8	Pacific sanddab	liver	Trans Nonachlor	E	15	ug/kg	
TFZONE2	8	Pacific sanddab	liver	Zinc		27.4	mg/kg	0.049
TFZONE2	9	Pacific sanddab	liver	Alpha (cis) Chlordane	E	12	ug/kg	
TFZONE2	9	Pacific sanddab	liver	Aluminum		7.95	mg/kg	0.583
TFZONE2	9	Pacific sanddab	liver	Arsenic		2.59	mg/kg	0.375

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE2	9	Pacific sanddab	liver	Barium		0.144	mg/kg	0.007
TFZONE2	9	Pacific sanddab	liver	Beryllium		0.005	mg/kg	0.003
TFZONE2	9	Pacific sanddab	liver	Cadmium		5.79	mg/kg	0.029
TFZONE2	9	Pacific sanddab	liver	Chromium		0.303	mg/kg	0.08
TFZONE2	9	Pacific sanddab	liver	Copper		4.35	mg/kg	0.068
TFZONE2	9	Pacific sanddab	liver	Hexachlorobenzene	E	8.2	ug/kg	
TFZONE2	9	Pacific sanddab	liver	Iron		86.4	mg/kg	0.096
TFZONE2	9	Pacific sanddab	liver	Lipids		46.1	%wt	0.005
TFZONE2	9	Pacific sanddab	liver	Manganese		0.697	mg/kg	0.007
TFZONE2	9	Pacific sanddab	liver	Mercury		0.065	mg/kg	0.03
TFZONE2	9	Pacific sanddab	liver	Nickel		0.198	mg/kg	0.094
TFZONE2	9	Pacific sanddab	liver	o,p-DDE	E	6.8	ug/kg	
TFZONE2	9	Pacific sanddab	liver	o,p-DDT	E	3.6	ug/kg	
TFZONE2	9	Pacific sanddab	liver	p,p-DDD	E	8.2	ug/kg	
TFZONE2	9	Pacific sanddab	liver	p,p-DDE		660	ug/kg	13.3
TFZONE2	9	Pacific sanddab	liver	p,p-DDT	E	13	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 101	E	9.7	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 105	E	5.6	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 110	E	10	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 118		20	ug/kg	13.3
TFZONE2	9	Pacific sanddab	liver	PCB 128	E	3.7	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 138		22	ug/kg	13.3
TFZONE2	9	Pacific sanddab	liver	PCB 149	E	6.8	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 151	E	4.8	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 153/168		41	ug/kg	13.3
TFZONE2	9	Pacific sanddab	liver	PCB 156	E	1.6	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 177	E	2.2	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 180		14	ug/kg	13.3
TFZONE2	9	Pacific sanddab	liver	PCB 183	E	4.9	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 187		14	ug/kg	13.3
TFZONE2	9	Pacific sanddab	liver	PCB 66	E	2.5	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 70	E	3.2	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 87	E	3	ug/kg	
TFZONE2	9	Pacific sanddab	liver	PCB 99	E	9.4	ug/kg	
TFZONE2	9	Pacific sanddab	liver	Selenium		1	mg/kg	0.06
TFZONE2	9	Pacific sanddab	liver	Silver		0.079	mg/kg	0.057
TFZONE2	9	Pacific sanddab	liver	Tin		1.7	mg/kg	0.24
TFZONE2	9	Pacific sanddab	liver	Total Solids		60.4	%wt	0.4
TFZONE2	9	Pacific sanddab	liver	Trans Nonachlor	E	9.1	ug/kg	
TFZONE2	9	Pacific sanddab	liver	Zinc		24.4	mg/kg	0.049
TFZONE3	1	Pacific sanddab	liver	Alpha (cis) Chlordane	E	8.7	ug/kg	
TFZONE3	1	Pacific sanddab	liver	Aluminum		8.58	mg/kg	0.583
TFZONE3	1	Pacific sanddab	liver	Arsenic		4.58	mg/kg	0.375
TFZONE3	1	Pacific sanddab	liver	Barium		0.104	mg/kg	0.007
TFZONE3	1	Pacific sanddab	liver	Beryllium		0.004	mg/kg	0.003
TFZONE3	1	Pacific sanddab	liver	Cadmium		4.16	mg/kg	0.029
TFZONE3	1	Pacific sanddab	liver	Chromium		0.237	mg/kg	0.08
TFZONE3	1	Pacific sanddab	liver	Copper		3.75	mg/kg	0.068
TFZONE3	1	Pacific sanddab	liver	Hexachlorobenzene	E	9.1	ug/kg	
TFZONE3	1	Pacific sanddab	liver	Iron		78	mg/kg	0.096
TFZONE3	1	Pacific sanddab	liver	Lipids		34.2	%wt	0.005

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE3	1	Pacific sanddab	liver	Manganese		0.782	mg/kg	0.007
TFZONE3	1	Pacific sanddab	liver	Mercury		0.097	mg/kg	0.03
TFZONE3	1	Pacific sanddab	liver	Nickel		0.141	mg/kg	0.094
TFZONE3	1	Pacific sanddab	liver	o,p-DDE	E	6.3	ug/kg	
TFZONE3	1	Pacific sanddab	liver	o,p-DDT	E	2.1	ug/kg	
TFZONE3	1	Pacific sanddab	liver	p,p-DDD	E	7.7	ug/kg	
TFZONE3	1	Pacific sanddab	liver	p,p-DDE		600	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	p,p-DDT	E	11	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 101		29	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 105		19	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 110		54	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 118		59	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 119	E	1.2	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 123	E	5.7	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 128		14	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 138		54	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 149		15	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 151	E	8.7	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 153/168		81	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 156	E	6.2	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 158	E	5.5	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 167	E	2.9	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 170	E	9.2	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 177	E	4.9	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 180		22	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 183	E	6.8	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 187		23	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 194	E	4.8	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 201	E	7	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 206	E	2.8	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 28	E	2	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 44	E	3.2	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 49	E	5.7	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 52		16	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	PCB 66	E	5.9	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 70	E	9.8	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 74	E	3.2	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 87	E	10	ug/kg	
TFZONE3	1	Pacific sanddab	liver	PCB 99		26	ug/kg	13.3
TFZONE3	1	Pacific sanddab	liver	Selenium		0.804	mg/kg	0.06
TFZONE3	1	Pacific sanddab	liver	Silver		0.076	mg/kg	0.057
TFZONE3	1	Pacific sanddab	liver	Tin		1.32	mg/kg	0.24
TFZONE3	1	Pacific sanddab	liver	Total Solids		51.5	%wt	0.4
TFZONE3	1	Pacific sanddab	liver	Trans Nonachlor	E	8.5	ug/kg	
TFZONE3	1	Pacific sanddab	liver	Zinc		23.2	mg/kg	0.049
TFZONE3	2	Pacific sanddab	liver	Alpha (cis) Chlordane	E	9.6	ug/kg	
TFZONE3	2	Pacific sanddab	liver	Aluminum		10.1	mg/kg	0.583
TFZONE3	2	Pacific sanddab	liver	Arsenic		3.48	mg/kg	0.375
TFZONE3	2	Pacific sanddab	liver	Barium		0.174	mg/kg	0.007
TFZONE3	2	Pacific sanddab	liver	Beryllium		0.005	mg/kg	0.003
TFZONE3	2	Pacific sanddab	liver	Cadmium		4.94	mg/kg	0.029

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE3	2	Pacific sanddab	liver	Chromium		0.339	mg/kg	0.08
TFZONE3	2	Pacific sanddab	liver	Copper		4.1	mg/kg	0.068
TFZONE3	2	Pacific sanddab	liver	Hexachlorobenzene	E	8.8	ug/kg	
TFZONE3	2	Pacific sanddab	liver	Iron		55.6	mg/kg	0.096
TFZONE3	2	Pacific sanddab	liver	Lipids		38.3	%wt	0.005
TFZONE3	2	Pacific sanddab	liver	Manganese		0.879	mg/kg	0.007
TFZONE3	2	Pacific sanddab	liver	Mercury		0.107	mg/kg	0.03
TFZONE3	2	Pacific sanddab	liver	Nickel		0.238	mg/kg	0.094
TFZONE3	2	Pacific sanddab	liver	o,p-DDE	E	6.5	ug/kg	
TFZONE3	2	Pacific sanddab	liver	o,p-DDT	E	3.8	ug/kg	
TFZONE3	2	Pacific sanddab	liver	p,p-DDD		14	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	p,p-DDE		830	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	p,p-DDT		14	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 101		24	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 105		14	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 110		32	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 118		43	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 119	E	1	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 123	E	3.7	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 128	E	11	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 138		49	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 149		14	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 151	E	7.4	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 153/168		71	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 156	E	4.8	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 158	E	4.2	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 167	E	2.5	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 170	E	8.6	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 177	E	4.1	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 180		25	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 183	E	7.5	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 187		22	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	PCB 194	E	5.3	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 201	E	6.6	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 206	E	2.3	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 28	E	1.6	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 49	E	4.6	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 52	E	8.9	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 66	E	5	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 70	E	7.5	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 74	E	3.1	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 87	E	7.6	ug/kg	
TFZONE3	2	Pacific sanddab	liver	PCB 99		21	ug/kg	13.3
TFZONE3	2	Pacific sanddab	liver	Selenium		0.936	mg/kg	0.06
TFZONE3	2	Pacific sanddab	liver	Silver		0.071	mg/kg	0.057
TFZONE3	2	Pacific sanddab	liver	Tin		1.47	mg/kg	0.24
TFZONE3	2	Pacific sanddab	liver	Total Solids		53.8	%wt	0.4
TFZONE3	2	Pacific sanddab	liver	Trans Nonachlor	E	9.4	ug/kg	
TFZONE3	2	Pacific sanddab	liver	Zinc		21.6	mg/kg	0.049
TFZONE3	3	Pacific sanddab	liver	Alpha (cis) Chlordane	E	12	ug/kg	
TFZONE3	3	Pacific sanddab	liver	Aluminum		10.2	mg/kg	0.583

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE3	3	Pacific sanddab	liver	Arsenic		2.33	mg/kg	0.375
TFZONE3	3	Pacific sanddab	liver	Barium		0.143	mg/kg	0.007
TFZONE3	3	Pacific sanddab	liver	Beryllium		0.005	mg/kg	0.003
TFZONE3	3	Pacific sanddab	liver	Cadmium		2.59	mg/kg	0.029
TFZONE3	3	Pacific sanddab	liver	Chromium		0.381	mg/kg	0.08
TFZONE3	3	Pacific sanddab	liver	Copper		3.82	mg/kg	0.068
TFZONE3	3	Pacific sanddab	liver	Hexachlorobenzene	E	9.8	ug/kg	
TFZONE3	3	Pacific sanddab	liver	Iron		76.4	mg/kg	0.096
TFZONE3	3	Pacific sanddab	liver	Lipids		46.6	%wt	0.005
TFZONE3	3	Pacific sanddab	liver	Manganese		0.644	mg/kg	0.007
TFZONE3	3	Pacific sanddab	liver	Mercury		0.059	mg/kg	0.03
TFZONE3	3	Pacific sanddab	liver	Nickel		0.21	mg/kg	0.094
TFZONE3	3	Pacific sanddab	liver	o,p-DDE	E	8.8	ug/kg	
TFZONE3	3	Pacific sanddab	liver	o,p-DDT	E	3.9	ug/kg	
TFZONE3	3	Pacific sanddab	liver	p,p-DDD		14	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	p,p-DDE		720	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	p,p-DDT		14	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 101		21	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 105	E	13	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 110		29	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 118		44	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 119	E	1.2	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 123	E	4.8	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 128	E	12	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 138		58	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 149		17	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 151	E	10	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 153/168		93	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 156	E	5	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 158	E	4.9	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 167	E	2.5	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 170	E	11	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 177	E	7.6	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 180		31	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 183	E	8.8	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 187		35	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	PCB 194	E	6.1	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 201	E	8.4	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 206	E	3.9	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 49	E	4.2	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 52	E	8	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 66	E	4.7	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 70	E	5.4	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 74	E	2.4	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 87	E	4.9	ug/kg	
TFZONE3	3	Pacific sanddab	liver	PCB 99		21	ug/kg	13.3
TFZONE3	3	Pacific sanddab	liver	Selenium		0.878	mg/kg	0.06
TFZONE3	3	Pacific sanddab	liver	Silver		0.065	mg/kg	0.057
TFZONE3	3	Pacific sanddab	liver	Tin		1.82	mg/kg	0.24
TFZONE3	3	Pacific sanddab	liver	Total Solids		57.3	%wt	0.4
TFZONE3	3	Pacific sanddab	liver	Trans Nonachlor	E	11	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE3	3	Pacific sanddab	liver	Zinc		19.7	mg/kg	0.049
TFZONE4	1	Pacific sanddab	liver	Alpha (cis) Chlordane		14	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	Aluminum		7.82	mg/kg	0.583
TFZONE4	1	Pacific sanddab	liver	Arsenic		2.61	mg/kg	0.375
TFZONE4	1	Pacific sanddab	liver	Barium		0.132	mg/kg	0.007
TFZONE4	1	Pacific sanddab	liver	Beryllium		0.005	mg/kg	0.003
TFZONE4	1	Pacific sanddab	liver	Cadmium		2.76	mg/kg	0.029
TFZONE4	1	Pacific sanddab	liver	Chromium		0.388	mg/kg	0.08
TFZONE4	1	Pacific sanddab	liver	Copper		4.3	mg/kg	0.068
TFZONE4	1	Pacific sanddab	liver	Hexachlorobenzene	E	10	ug/kg	
TFZONE4	1	Pacific sanddab	liver	Iron		61.3	mg/kg	0.096
TFZONE4	1	Pacific sanddab	liver	Lipids		53.1	%wt	0.005
TFZONE4	1	Pacific sanddab	liver	Manganese		0.634	mg/kg	0.007
TFZONE4	1	Pacific sanddab	liver	Mercury		0.057	mg/kg	0.03
TFZONE4	1	Pacific sanddab	liver	Nickel		0.296	mg/kg	0.094
TFZONE4	1	Pacific sanddab	liver	o,p-DDE	E	9.9	ug/kg	
TFZONE4	1	Pacific sanddab	liver	o,p-DDT	E	2.4	ug/kg	
TFZONE4	1	Pacific sanddab	liver	p,p-DDD	E	8.4	ug/kg	
TFZONE4	1	Pacific sanddab	liver	p,p-DDE		690	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	p,p-DDT	E	11	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 101		14	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	PCB 105	E	8.1	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 110		19	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	PCB 118		29	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	PCB 123	E	3.1	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 128	E	9.4	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 138		41	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	PCB 149	E	9.8	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 151	E	6.8	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 153/168		64	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	PCB 158	E	2.7	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 170	E	8.1	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 180		23	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	PCB 183	E	7.1	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 187		21	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	PCB 201	E	4.5	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 52	E	5.7	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 66	E	3.7	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 70	E	4	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 87	E	3	ug/kg	
TFZONE4	1	Pacific sanddab	liver	PCB 99		15	ug/kg	13.3
TFZONE4	1	Pacific sanddab	liver	Selenium		0.971	mg/kg	0.06
TFZONE4	1	Pacific sanddab	liver	Silver		0.067	mg/kg	0.057
TFZONE4	1	Pacific sanddab	liver	Tin		1.75	mg/kg	0.24
TFZONE4	1	Pacific sanddab	liver	Total Solids		64.3	%wt	0.4
TFZONE4	1	Pacific sanddab	liver	Trans Nonachlor	E	12	ug/kg	
TFZONE4	1	Pacific sanddab	liver	Zinc		21.8	mg/kg	0.049
TFZONE4	2	Pacific sanddab	liver	Alpha (cis) Chlordane	E	10	ug/kg	
TFZONE4	2	Pacific sanddab	liver	Aluminum		12.2	mg/kg	0.583
TFZONE4	2	Pacific sanddab	liver	Arsenic		2.02	mg/kg	0.375
TFZONE4	2	Pacific sanddab	liver	Barium		0.175	mg/kg	0.007

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE4	2	Pacific sanddab	liver	Beryllium		0.009	mg/kg	0.003
TFZONE4	2	Pacific sanddab	liver	Cadmium		2.58	mg/kg	0.029
TFZONE4	2	Pacific sanddab	liver	Chromium		0.397	mg/kg	0.08
TFZONE4	2	Pacific sanddab	liver	Copper		2.83	mg/kg	0.068
TFZONE4	2	Pacific sanddab	liver	Hexachlorobenzene	E	9.6	ug/kg	
TFZONE4	2	Pacific sanddab	liver	Iron		78	mg/kg	0.096
TFZONE4	2	Pacific sanddab	liver	Lipids		51.4	%wt	0.005
TFZONE4	2	Pacific sanddab	liver	Manganese		0.56	mg/kg	0.007
TFZONE4	2	Pacific sanddab	liver	Mercury		0.042	mg/kg	0.03
TFZONE4	2	Pacific sanddab	liver	Nickel		0.261	mg/kg	0.094
TFZONE4	2	Pacific sanddab	liver	o,p-DDE	E	9.9	ug/kg	
TFZONE4	2	Pacific sanddab	liver	o,p-DDT	E	2.7	ug/kg	
TFZONE4	2	Pacific sanddab	liver	p,p-DDD	E	12	ug/kg	
TFZONE4	2	Pacific sanddab	liver	p,p-DDE		860	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	p,p-DDT		14	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 101		15	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 105	E	9.3	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 110		20	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 118		32	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 123	E	3.6	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 128	E	9.1	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 138		45	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 149	E	11	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 151	E	9.2	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 153/168		72	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 156	E	3.3	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 158	E	4	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 167	E	2.3	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 170	E	8.3	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 177	E	4.7	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 180		24	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 183	E	8.4	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 187		24	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	PCB 201	E	6.6	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 66	E	4.1	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 70	E	4.6	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 87	E	4.9	ug/kg	
TFZONE4	2	Pacific sanddab	liver	PCB 99		16	ug/kg	13.3
TFZONE4	2	Pacific sanddab	liver	Selenium		0.856	mg/kg	0.06
TFZONE4	2	Pacific sanddab	liver	Silver		0.062	mg/kg	0.057
TFZONE4	2	Pacific sanddab	liver	Tin		1.86	mg/kg	0.24
TFZONE4	2	Pacific sanddab	liver	Total Solids		65	%wt	0.4
TFZONE4	2	Pacific sanddab	liver	Trans Nonachlor	E	16	ug/kg	
TFZONE4	2	Pacific sanddab	liver	Zinc		17.3	mg/kg	0.049
TFZONE4	3	Pacific sanddab	liver	Alpha (cis) Chlordane	E	7.6	ug/kg	
TFZONE4	3	Pacific sanddab	liver	Aluminum		13.5	mg/kg	0.583
TFZONE4	3	Pacific sanddab	liver	Arsenic		3.58	mg/kg	0.375
TFZONE4	3	Pacific sanddab	liver	Barium		0.154	mg/kg	0.007
TFZONE4	3	Pacific sanddab	liver	Beryllium		0.007	mg/kg	0.003
TFZONE4	3	Pacific sanddab	liver	Cadmium		4.3	mg/kg	0.029
TFZONE4	3	Pacific sanddab	liver	Chromium		0.523	mg/kg	0.08

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE4	3	Pacific sanddab	liver	Copper		4.26	mg/kg	0.068
TFZONE4	3	Pacific sanddab	liver	Hexachlorobenzene	E	7.7	ug/kg	
TFZONE4	3	Pacific sanddab	liver	Iron		92.6	mg/kg	0.096
TFZONE4	3	Pacific sanddab	liver	Lipids		32.6	%wt	0.005
TFZONE4	3	Pacific sanddab	liver	Manganese		0.686	mg/kg	0.007
TFZONE4	3	Pacific sanddab	liver	Mercury		0.092	mg/kg	0.03
TFZONE4	3	Pacific sanddab	liver	Nickel		0.242	mg/kg	0.094
TFZONE4	3	Pacific sanddab	liver	p,p-DDD	E	8.8	ug/kg	
TFZONE4	3	Pacific sanddab	liver	p,p-DDE		610	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	p,p-DDT		14	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 101		14	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 105	E	10	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 110		22	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 118		35	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 123	E	3.7	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 128	E	12	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 138		50	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 149	E	11	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 151	E	7.6	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 153/168		81	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 156	E	3.1	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 158	E	4.1	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 167	E	2.2	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 170	E	9	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 177	E	4.7	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 180		30	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 183	E	9.6	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 187		31	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	PCB 201	E	8.1	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 49	E	2.9	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 52	E	5.7	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 66	E	3.1	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 70	E	3.8	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 87	E	4	ug/kg	
TFZONE4	3	Pacific sanddab	liver	PCB 99		16	ug/kg	13.3
TFZONE4	3	Pacific sanddab	liver	Selenium		1.07	mg/kg	0.06
TFZONE4	3	Pacific sanddab	liver	Silver		0.08	mg/kg	0.057
TFZONE4	3	Pacific sanddab	liver	Tin		1.72	mg/kg	0.24
TFZONE4	3	Pacific sanddab	liver	Total Solids		58.1	%wt	0.4
TFZONE4	3	Pacific sanddab	liver	Trans Nonachlor	E	10	ug/kg	
TFZONE4	3	Pacific sanddab	liver	Zinc		21.5	mg/kg	0.049
TFZONE4	4	Bigmouth sole	liver	Hexachlorobenzene	E	1.4	ug/kg	
TFZONE4	4	Bigmouth sole	liver	Lipids		8.61	%wt	0.005
TFZONE4	4	Bigmouth sole	liver	p,p-DDE		88	ug/kg	13.3
TFZONE4	4	Bigmouth sole	liver	PCB 101	E	2.6	ug/kg	
TFZONE4	4	Bigmouth sole	liver	PCB 110	E	3.6	ug/kg	
TFZONE4	4	Bigmouth sole	liver	PCB 118	E	9.9	ug/kg	
TFZONE4	4	Bigmouth sole	liver	PCB 128	E	2.8	ug/kg	
TFZONE4	4	Bigmouth sole	liver	PCB 138		15	ug/kg	13.3
TFZONE4	4	Bigmouth sole	liver	PCB 153/168		23	ug/kg	13.3
TFZONE4	4	Bigmouth sole	liver	PCB 158	E	1.6	ug/kg	

Appendix D.3 October 2003

Station	Rep	Species	Tissue	Parameter		Value	Units	MDL
TFZONE4	4	Bigmouth sole	liver	PCB 180	E	8.8	ug/kg	
TFZONE4	4	Bigmouth sole	liver	PCB 183	E	2.1	ug/kg	
TFZONE4	4	Bigmouth sole	liver	PCB 187	E	6.9	ug/kg	
TFZONE4	4	Bigmouth sole	liver	PCB 99	E	4.3	ug/kg	
TFZONE4	5	Longfin sanddab	liver	Alpha (cis) Chlordane	E	7.9	ug/kg	
TFZONE4	5	Longfin sanddab	liver	Hexachlorobenzene	E	5.5	ug/kg	
TFZONE4	5	Longfin sanddab	liver	Lipids		25.6	%wt	0.005
TFZONE4	5	Longfin sanddab	liver	o,p-DDE		34	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	o,p-DDT	E	3.8	ug/kg	
TFZONE4	5	Longfin sanddab	liver	p,p-DDD		16	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	p,p-DDE		1700	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	p,p-DDT	E	8.7	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 101		16	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 105	E	13	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 110		19	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 118		51	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 123	E	4.3	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 128		19	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 138		88	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 149		17	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 151		15	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 153/168		140	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 156	E	6.1	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 158	E	6.6	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 167	E	3.8	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 170		21	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 177	E	9.3	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 180		53	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 183		16	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 187		54	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 194	E	13	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 201		16	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	PCB 206	E	7.1	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 28	E	2	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 52	E	6.8	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 66	E	4.1	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 87	E	3.2	ug/kg	
TFZONE4	5	Longfin sanddab	liver	PCB 99		28	ug/kg	13.3
TFZONE4	5	Longfin sanddab	liver	Trans Nonachlor	E	16	ug/kg	